

# Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/GB05/000703

International filing date: 25 February 2005 (25.02.2005)

Document type: Certified copy of priority document

Document details: Country/Office: GB  
Number: 0404155.4  
Filing date: 25 February 2004 (25.02.2004)

Date of receipt at the International Bureau: 26 April 2005 (26.04.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland  
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse



GB05/703



INVESTOR IN PEOPLE

The Patent Office  
Concept House  
Cardiff Road  
Newport  
South Wales  
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

I also certify that the application is now proceeding in the name as identified herein.

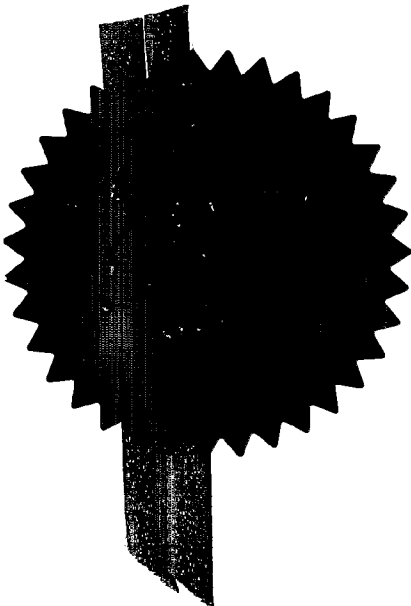
In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed

Dated 8 April 2005







INVESTOR IN PEOPLE

**GB 0404155.4**

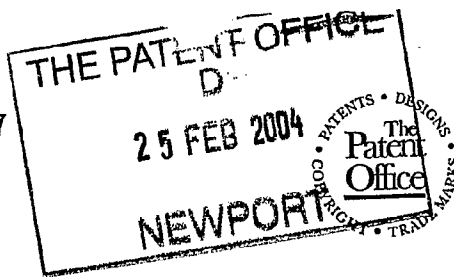
By virtue of a direction given under Section 30 of the Patents Act 1977, the application is proceeding in the name of:

**SCOTT-TRACK IP LIMITED,  
68-82 Boden Street,  
GLASGOW,  
G40 3PX,  
United Kingdom**

**Incorporated in the United Kingdom,**

**[ADP No. 09009242001]**





25FEB04 E075939-6 002884  
POL/7700 0.00-0404155.4 ACCOUNT CHA

The Patent Office

Cardiff Road  
Newport  
South Wales  
NP10 8QQ

# Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

1. Your reference	P36743-/LBO/SCA/JDB		
2. Patent application number (The Patent Office will fill in this part)	25 FEB 2004	0404155.4	
3. Full name, address and postcode of the or of each applicant (underline all surnames)	Scott-Track Limited 68-82 Boden Street Glasgow G40 3PX  0844 7161001 Patents ADP number (if you know it)  If the applicant is a corporate body, give the country/state of its incorporation United Kingdom		
4. Title of the invention	"Turnout/Crossover Section for Railway Track"		
5. Name of your agent (if you have one)	Murgitroyd & Company		
"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	Scotland House 165-169 Scotland Street Glasgow G5 8PL  Patents ADP number (if you know it) 1198015 ✓		
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day / month / year)
7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application		Date of filing (day / month / year)
8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))	Yes		

SECTION 30 (1977 ACT) APPLICATION FILED 16/11/04

# Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form.  
Do not count copies of the same document

Continuation sheets of this form	-
Description	46
Claim(s)	-
Abstract	-
Drawing(s)	38 238

10. If you are also filing any of the following, state how many against each item.

Priority documents	-
Translations of priority documents	-
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	-
Request for preliminary examination and search (Patents Form 9/77)	-
Request for substantive examination (Patents Form 10/77)	-
Any other documents (please specify)	-

11. I/We request the grant of a patent on the basis of this application.

Signature *Murgitroyd & Company* Date 24/02/2004  
Murgitroyd & Company

12. Name and daytime telephone number of person to contact in the United Kingdom James D Brown 01224 706616

## Warning

*After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.*

## Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.
- Write your answers in capital letters using black ink or you may type them.
- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- If you have answered 'Yes' Patents Form 7/77 will need to be filed.
- Once you have filled in the form you must remember to sign and date it.
- For details of the fee and ways to pay please contact the Patent Office.

1     "Turnout/Crossover Section for Railway Track"

2

3     The present invention relates to a turnout or  
4     crossover section of railway track and particularly  
5     but not exclusively relates to providing a temporary  
6     non-intrusive turnout or crossover section of a  
7     railway track.

8

9     Railway track requires to be maintained at regular  
10    intervals and in order to do this, the section of  
11    track that is being maintained must be cleared of  
12    trains. The track is normally closed to traffic  
13    often during no train periods and also out-with such  
14    periods thus causing train cancellations or trains  
15    being diverted to other routes for short or longer  
16    terms (blockades). In some instances, the trains  
17    are transferred from the track having the  
18    maintenance performed on it onto an adjacent track  
19    for a limited period (i.e. a few hours) and then  
20    back onto the original track. The trains are  
21    transferred onto the adjacent track by means of a



1 crossover section of track and returned by means of  
2 a second crossover. This is known in the art as  
3 "Single Line Working" (SLW). Conventionally, each  
4 of the crossover sections are intrusive, in that the  
5 section of track at which the crossover section is  
6 inserted must be cut; this involves cutting the  
7 existing rails of each railway track twice and  
8 installing the temporary crossover and also  
9 installing the switchgear along with providing an  
10 interface for signalling. However, such an  
11 intrusive crossover section is relatively expensive  
12 and requires a fairly long time to plan and to  
13 install, where the planning stage alone may take in  
14 the region of 2 years. The only other known  
15 alternative to solve this problem is to allow the  
16 trains to crossover at the nearest permanent  
17 crossover sections before and after the maintenance  
18 site but these may be many miles away and thus if  
19 repair or maintenance is required on only a few  
20 metres of track, trains may be forced to share one  
21 line of track for both directions (i.e. SLW) for  
22 many miles or may be extensively diverted onto  
23 alternative routes, thus leading to inefficiency and  
24 delays.

25  
26 Those in the rail industry will also realise that  
27 there is a conflict between passengers who require  
28 train services during the daytime and freight trains  
29 which operate during the night and thus there is  
30 very little time to effect such repairs and  
31 maintenance. The overriding difficulty is access to  
32 the track for cost efficient maintenance.

1 It will be understood by those skilled in the art  
2 that a crossover comprises two individual turnouts,  
3 where a turnout can be used on its own or can be  
4 combined with another turnout to form a crossover.

5  
6 In the context of this application, it should be  
7 noted that a non-intrusive crossover is one that  
8 does not pass through the rail to be crossed but  
9 instead crosses over the rail to be crossed.

10  
11 According to a first aspect of the present invention  
12 there is provided a turnout for a railway track  
13 comprising a pair of spaced apart rails, the turnout  
14 comprising a raised track surface which is adapted  
15 to provide a path along which the wheels of a train  
16 can travel from one railway track to another,  
17 wherein the raised track surface comprises first and  
18 second portions and is arranged such that the wheels  
19 of the train are first raised by the first portion  
20 to a first rail crossing height and then lowered by  
21 the second portion to a height at a location between  
22 the pair of spaced apart rails of the railway track.

23  
24 According to a first aspect of the present invention  
25 there is also provided a method of transferring a  
26 train from one railway track comprising a pair of  
27 spaced apart rails to a second railway track  
28 comprising a pair of spaced apart rails, the method  
29 comprising the steps of:-

30 providing a raised track surface having a first  
31 portion which comprises a raised portion and a  
32 second portion which comprises a lower portion

1 provided at a location between the spaced apart  
2 rails of the railway track, where the raised track  
3 surface is adapted to provide a path along which the  
4 wheels of the train can travel from the first to the  
5 second railway track;

6 driving the train along the first track and  
7 onto the raised track surface, wherein the first  
8 raised portion of is of a sufficient height such  
9 that the wheels of the train are arranged to clear  
10 the pair of spaced apart rails of the railway track;  
11 and

12 continuing to drive the train onto the second  
13 lower portion of the raised track surface.

14  
15 Preferably, the turnout is further adapted such that  
16 the wheels of the train are first raised to a rail  
17 crossing height in order for a first wheel to cross  
18 a first rail, then lowered to a height at a location  
19 between the pair of spaced apart rails, then raised  
20 to the rail crossing height in order for a second  
21 wheel to cross the first rail, then preferably  
22 lowered to a height at a location between the first  
23 and second railway tracks.

24  
25 The invention has the advantage that it permits  
26 short length Single Line Working without the need  
27 for relatively high track portions in between the  
28 spaced apart pair of rails of the railway track.

29  
30 Preferably, a crossover comprises a pair of said  
31 turnouts.

1 Typically, the first and/or second non-intrusive  
2 crossover comprise a raised track surface, and  
3 preferably the raised track surface is provided with  
4 a supporting means to allow for passage of trains.

5  
6 Typically, each of the first and second non-  
7 intrusive crossovers comprise a pair of turnouts,  
8 and preferably each pair of turnouts comprise a pair  
9 of rails which form the raised track surface.

10  
11 Typically, each rail of the turnout further  
12 comprises at least a ramp surface, wherein, each  
13 ramp surface is preferably tapered from a short or  
14 no height end to a relatively tall height end. Most  
15 preferably, each ramp surface comprises a linear  
16 taper from the short or no height end to the  
17 relatively tall height end, and preferably the  
18 relatively tall height end is of the same height as  
19 that of the first rail crossing height. Typically,  
20 the relatively tall height end of the ramp surface  
21 is adjacent to an end of the raised track surface at  
22 its first rail crossing height, the two combining to  
23 provide a path along which the wheel is permitted to  
24 travel whilst maintaining a substantially equal  
25 distance between a pair of raised rails, which  
26 combined, form the raised track surface.

27 Preferably, the ramp surface comprises a ramp for  
28 each rail of the railway track, where both ramps  
29 preferably incline simultaneously, typically  
30 avoiding differential levels, in relation to the  
31 respective rails.

32

1 At least a crossing portion of each rail of the  
2 raised track surface may comprise a slot formed  
3 therein, typically below a rail head portion,  
4 wherein the slot may be arranged to lie over or  
5 around the rail being crossed and the rail head  
6 portion is releasably fixed to the said rail being  
7 crossed.

8  
9 At least a crossing portion of each rail of the  
10 raised track surface, which typically forms part of  
11 a crossing rail, or a switch rail preferably  
12 comprises a railhead portion arranged to lie over or  
13 around a supporting member which in turn is  
14 preferably arranged to lie over or around the rail  
15 being crossed. Preferably, the supporting member is  
16 arranged with its longitudinal axis being parallel  
17 to the rails of the parent rail. Preferably, the  
18 supporting member comprises at least an upper  
19 supporting member and at least a lower supporting  
20 member. Preferably, the upper supporting member is  
21 planar and more preferably, the upper surface of the  
22 upper supporting member is attached to the a lower  
23 surface of the crossing portion of the raised track.  
24 Preferably, at least another portion of the raised  
25 track surface, which is typically the ramp surface,  
26 is supported by the parent rail and a fixing means.

27  
28 Typically, the upper supporting planar member is  
29 substantially wider than an existing rail of one of  
30 the first and second railway tracks.

31

1 Preferably, the upper supporting planar member is  
2 rectangular in shape, and more preferably, is in the  
3 form of a plate.

4  
5 Preferably, a pair of guide means are provided along  
6 at least a portion of the upper supporting member's  
7 length. Preferably the guide means run parallel to  
8 the upper supporting member's longitudinal axis, and  
9 more preferably, project downwardly in order, in  
10 use, to straddle an existing rail of the first and  
11 second existing railway tracks.

12  
13 Preferably, a pair of lower supporting members are  
14 provided at either side of at least a portion of the  
15 existing rail.

16  
17 Preferably, the pair of lower supporting members  
18 combine to provide a substantially similar shape,  
19 width and position along the existing railway track  
20 as the upper supporting member, and are adapted to  
21 be releasably engaged thereto and more preferably,  
22 releasably fixed thereto, wherein the lower surface  
23 of the upper supporting planar member preferably  
24 lies on top of the uppermost surface of the lower  
25 supporting members. Most preferably, the upper  
26 supporting member is moveably coupled to at least  
27 one of the lower supporting members, typically by a  
28 hinge means. The hinge means has the advantage of  
29 permitting the upper supporting member to move  
30 between a first configuration in which the upper  
31 supporting member is arranged in a substantially  
32 horizontal plane and rests upon the pair of lower

1 supporting members over the existing rail of the  
2 railway track and a second configuration in which  
3 the upper supporting member is remote from the  
4 existing rail such that a train wheel may be driven  
5 along the existing rail in "normal running".  
6 Preferably, the upper supporting member is moved  
7 from the first to the second configuration by  
8 rotating the upper supporting member about the hinge  
9 means relative to the lower supporting member.

10

11 Alternatively, the lower supporting members combine  
12 to be longer and/or wider than the upper supporting  
13 member.

14

15 According to a second aspect of the present  
16 invention there is provided a turnout for a railway  
17 track comprising a pair of spaced apart rails, the  
18 turnout comprising a raised track surface which is  
19 adapted to provide a path along which the wheels of  
20 a train can travel from one railway track to  
21 another, wherein the raised track surface comprises  
22 a crossing rail portion adapted to cross over one of  
23 the spaced apart rails, the crossing rail portion  
24 being coupled to an upper supporting member which,  
25 in use, rests upon and is supported by at least one  
26 lower supporting member, characterised in that the  
27 upper and at least one lower supporting members are  
28 coupled to one another by a moveable mechanism.

29

30 Preferably, there are a pair of lower supporting  
31 members which typically combine to provide a  
32 substantially similar shape, width and position

1 along the existing railway track as the upper  
2 supporting member. Preferably, the upper supporting  
3 member comprises a substantially planar member and  
4 more preferably, the lower surface of the upper  
5 supporting planar member lies on top of the  
6 uppermost surface of the lower supporting members.  
7 Most preferably, the moveable mechanism comprises a  
8 hinge mechanism. The hinge mechanism is typically  
9 arranged to permit the upper supporting member to  
10 move between a first configuration in which the  
11 upper supporting member is arranged in a  
12 substantially horizontal plane and rests upon the  
13 pair of lower supporting members over the existing  
14 rail of the railway track and a second configuration  
15 in which the upper supporting member is remote from  
16 the existing rail such that a train wheel may be  
17 driven along the existing rail in "normal running".  
18 Preferably, the upper supporting member is moved  
19 from the first to the second configuration by  
20 rotating the upper supporting member about the hinge  
21 means relative to the lower supporting member.

22  
23 Preferably, normal running of a train along the  
24 first and/or second existing railway track(s) may be  
25 allowed, where the train does not travel between the  
26 first and second existing railway tracks by moving  
27 or removing one or more sections of the crossover  
28 from engagement with the first and/or second  
29 existing railway tracks. Preferably, the one or  
30 more moveable or removable sections comprise at  
31 least a ramp, a first raised portion of the raised  
32 track surface, at least an upper supporting member,



1 and leaving in place the second lower portion of the  
2 raised track surface, and may include leaving in  
3 place at least one of the lower supporting members.

4  
5 In a first embodiment, the second lower portion of  
6 the raised track surface is adapted to be at a  
7 height which is lower than the first raised portion.  
8 This has the advantage of preventing the second  
9 lower portion from protruding above the horizontal  
10 plane defined by the upper surface of the existing  
11 rails of the railway track by more than an  
12 acceptable level during normal running.

13  
14 Typically, at least the crossing portion of the  
15 raised track surface, is formed on top of a rail  
16 head portion or more particularly when referring to  
17 the crossing rail, a raised crossover member,  
18 wherein the height of the raised crossover member at  
19 least equals, and is preferably greater than, the  
20 depth of a flange portion of the wheel of the train.

21  
22 Typically, the raised track surface comprises a  
23 plurality of rail members, one or more of which  
24 comprise a curved radius away from one of the  
25 railway tracks towards the other railway track.

26  
27 Preferably, the plurality of rail members combine to  
28 form a turnout having a substantially continuous  
29 rail surface and includes the following components:-

30 the said first portion which includes a ramp  
31 member adapted to raise the train wheel to the rail  
32 crossing height;

1 a curved radius rail adapted to urge the train  
2 away from one of the railway tracks towards the  
3 other railway track;

4 the second portion which includes a further  
5 ramp member adapted to lower the train wheel to a  
6 lower height at a location in between the pair of  
7 spaced apart rails of the railway track;  
8 another first portion which includes a further ramp  
9 member to raise the train wheel from the lower  
10 height to a rail crossing height; and

11 a crossover rail adapted to allow the train to  
12 pass over an inner rail of the first existing  
13 railway track at the raised height.

14

15 The turnout may then further comprise another second  
16 portion which includes a further ramp member adapted  
17 to lower the train wheel to a lower height at a  
18 location in-between the inside rails of the first  
19 and second railway tracks;

20

21 Typically, at least a portion of the raised track  
22 surface, such as the substantially straight rail, is  
23 supported in the lateral and or vertical direction  
24 at a plurality of locations along its length by a  
25 support device. Preferably, the support device  
26 comprises a plurality of sleeper supports and more  
27 preferably comprises a plurality of pot sleeper  
28 arrangements.

29

30 Preferably, the one or more turnouts are temporary  
31 turnouts and more preferably are non-intrusive  
32 turnouts.

1 Typically, the pot sleeper arrangements comprise a  
2 body having an, in use, substantially planar upper  
3 surface onto which rails may be connected;  
4 front and rear faces which extend downwardly at  
5 an angle to the upper surface, the faces having  
6 lower contact edges for contact with the ground; and  
7 a pair of side ends which extend downwardly at  
8 an angle to the upper surface for a greater distance  
9 than the front and rear faces.

10

11 The pot sleeper arrangements have the advantage that  
12 the pair of side ends project, in use, into the  
13 ground thereby providing resistance against lateral  
14 (side to side) movement of the pot sleeper, whilst  
15 the main weight of the pot sleeper, rail and train  
16 is borne by the contact edges and/or the underside  
17 of the substantially planar upper surface.

18

19 Preferably, said lower contact edges having a  
20 greater surface area than the cross-sectional area  
21 of the front and rear sides.

22

23 Preferably, the front and rear faces combine with  
24 the upper surface to form an inverted 'U' shaped  
25 body, whilst the pair of side ends combine to close  
26 the longitudinal axis of the 'U' shaped body.

27 Preferably, the body is hollow, where the hollow  
28 body may be partially or wholly filled with a  
29 filling material and more preferably, the contact  
30 edges are formed by lips which project either  
31 inwardly or outwardly from the body (preferably

1 outwardly) to provide a greater surface area to the  
2 body on the, in use, horizontal plane.

3  
4 Typically, the upper surface is provided with a  
5 coupling mechanism to permit coupling of the pot  
6 sleeper to a rail. Preferably, a connection  
7 mechanism is provided to couple a first to a second  
8 respective pot sleeper, where the connection  
9 mechanism may include a substantially rigid member  
10 which extends therebetween. Typically, the  
11 substantially rigid member may be arranged to pass  
12 underneath the rails of the existing railway track.

13  
14 Preferably, the pot sleepers are driven into ground  
15 ballast by a mechanical means which may be a  
16 vibrating mechanism means. Typically, further  
17 ballast or other material may be inserted into the  
18 hollow body to maintain/increase the height of the  
19 pot sleeper, in use.

20  
21 According to a third aspect of the present invention  
22 there is provided a turnout for a railway track  
23 comprising a pair of spaced apart rails, the turnout  
24 comprising a raised track surface which is adapted  
25 to provide a path along which the wheels of a train  
26 can travel from one railway track to another,  
27 wherein the raised track surface comprises a ramp  
28 member to permit a wheel of a train to enter the  
29 raised track surface, the ramp member comprising:-  
30 a fixing mechanism to releasably secure the  
31 ramp member to one of the spaced apart rails;

1 an upper ramp surface which in use provides a  
2 rail surface for a tread of the wheel to traverse;  
3 and

4 a lead-in portion which is arranged at one side  
5 of the said one of the spaced apart rails, wherein  
6 the lead-in portion comprises an upper rail surface  
7 which, in use, is inclined at an angle to the  
8 horizontal axis and which provides a rail surface  
9 for a portion of the tread to traverse.

10

11 Preferably, the upper rail surface of the lead-in  
12 portion is arranged to lie at one side of the said  
13 one of the spaced apart rails and has an outermost  
14 end which is arranged to be located at a height  
15 lower than the upper rail surface of the said one of  
16 the spaced apart rails and an innermost end which  
17 merges into the rest of the upper rail surface of  
18 the ramp member.

19

20 Preferably, the portion of the ramp member which  
21 merges from the lead-in portion to the rest of the  
22 upper rail surface is also arranged at an angle  
23 between the transverse direction of the rail surface  
24 and the longitudinal axis of the rail surface.

25

26 Embodiments of the present invention will now be  
27 described, by way of example only, with reference to  
28 the accompanying drawings, in which:-

29

30 Fig. 1 is a plan view of temporary non-  
31 intrusive turnout as described in our co-pending  
32 International (PCT) Application No PCT/GB03/03555;

1           Fig. 2 is a plan view of a portion of the  
2 turnout of Fig. 1 highlighted as detail 1;

3           Fig. 3a is a cross-sectional view across  
4 section B-B of Fig. 2;

5           Fig. 3b is a side view of a portion of the  
6 turnout shown in the direction of A-A of Fig. 2;

7           Fig. 4 is a close up view of a G-clamp  
8 indicated in Fig. 6 as detail 2;

9           Fig. 5 is a close up view of a G-clamp of Fig.  
10 7a indicated as detail 3;

11          Fig. 6 is a cross-sectional view across section  
12 C-C of Fig. 1;

13          Fig. 7a is a cross-sectional view across  
14 section D-D of Fig. 1;

15          Fig. 7b is a side view of the portion of the  
16 turnout shown in Fig. 7a;

17          Fig. 8 is a cross-sectional view across section  
18 E-E of Fig. 1;

19          Fig. 9a is a close up plan view of the portion  
20 of the turnout indicated in Fig. 1 as detail 4;

21          Fig. 9b is a cross-sectional view across  
22 section F-F of Fig. 9a;

23          Fig. 10 is a perspective view of a scale model  
24 of a temporary non-intrusive turnout, substantially  
25 identical to that shown in Fig. 1 during  
26 installation;

27          Fig. 11 is a perspective view of the turnout  
28 section of Fig. 10 further on during construction;

29          Fig. 12 is a perspective view of the turnout  
30 section of Fig. 11 further on during construction;

31          Fig. 13 is a perspective view of the turnout  
32 section of Fig. 12 further on during construction;

1           Fig. 14 is a plan view of one end of the  
2 turnout section of Fig. 13;

3           Fig. 15 is a perspective view of a model  
4 representing a train as it enters the turnout  
5 section of Fig. 14;

6           Fig. 16 is a perspective view of the model of  
7 Fig. 15 as it progresses through the turnout  
8 section;

9           Fig. 17 is a perspective view of the model of  
10 Fig. 16 as it progresses further through the turnout  
11 section;

12           Fig. 18 is a perspective view of the model of  
13 Fig. 17 as it nears the end of the turnout section;

14           Fig. 19a is a plan view of an alternative  
15 switch rail to that shown in Fig. 1, where the  
16 switch rail is mounted on a support plate;

17           Fig. 19b is a cross-sectional view of the  
18 switch rail of Fig. 19a;

19           Fig. 19c is a plan view of the switch rail and  
20 support plate of Fig. 19a;

21           Fig. 19d is a side view of the support plate of  
22 Fig. 19a;

23           Fig. 19e is a side view of an end of the switch  
24 rail of Fig. 19a;

25           Fig. 19f is an end view of the end of the  
26 switch rail of Fig. 19e;

27           Fig. 20a is a plan view of an alternative  
28 embodiment of crossing rail to that shown in Fig. 1;

29           Fig. 20b is a cross-sectional view of the  
30 crossing rail of Fig. 20a;

31           Fig. 20c is a side view of an end of the  
32 crossing rail of Fig. 20a;

1           Fig. 20d is an end view of the end of the  
2 crossing rail of Fig. 20c;

3           Fig. 21a is a plan view of the crossing rail of  
4 Fig. 20a as it crosses an existing rail of a railway  
5 track;

6           Fig. 21b is a cross-sectional view of the  
7 crossing rail taken through the line A-A of Fig.  
8 21a;

9           Fig. 21c is a plan view of the crossing rail of  
10 Fig. 21a without the existing rail for clarity;

11          Fig. 21d is a side view of the crossing rail of  
12 Fig. 21c;

13          Figs. 22a, b, c and d are side views of  
14 possible/optional gutt rail deflecting means for use  
15 with a gutt rail of the turnout of Fig. 1;

16          Fig. 23a is a plan view of level crossing  
17 support members for supporting the switch rail of  
18 Fig. 19a;

19          Fig. 23b is a cross-sectional view of level  
20 crossing support members of Fig. 23a;

21          Fig. 23c is a detailed plan view of level  
22 crossing support members for supporting the crossing  
23 rails of the turnout of Fig. 1;

24          Fig. 23d is a cross-sectional view of the level  
25 crossing support members and the crossing rail of  
26 Fig. 23c;

27          Fig. 23e is an plan overview showing the  
28 position of the level crossing support members of  
29 Fig. 23c within the crossover;

30          Fig. 24a is a perspective view of a further  
31 turnout as described in our co-pending International  
32 (PCT) Application No PCT/GB03/03555;



1           Fig. 24b is a plan view of the switch rail and  
2   ramp rails and associated level crossing support  
3   members of the turnout of Fig. 24a;

4           Fig. 24c is a perspective view of the temporary  
5   turnout of Fig. 24a, also showing an arrangement of  
6   pot sleepers as described in our co-pending  
7   International (PCT) Application No PCT/GB03/03555;

8           Fig. 25a is a side view of the ramp rails  
9   leading onto the switch rails of the turnout of Fig.  
10  24a;

11          Fig. 25b is side view showing one of the train  
12  wheels mid-way up the ramp rail of Fig. 25a;

13          Fig. 26 is a perspective view showing the ramp  
14  rail and clamping mechanism;

15          Figs. 27a and 28a are perspective view  
16  photographs showing the crossing rail of Fig. 24a  
17  during installation;

18          Figs. 29a, b, c, d are end view photographs  
19  showing the train wheels passing a portion of the  
20  support members of Fig. 24b during normal running;

21          Fig. 29a and 29f show the support members and  
22  gutt rails of Fig. 29a in position during normal  
23  running;

24          Fig. 29g is a perspective view showing the  
25  support members of Fig. 29a prior to installation;

26          Fig. 30 is a perspective view showing the train  
27  passing over the crossing rails of Fig. 29a, whilst  
28  clearing the main tracks;

29          Fig. 31a and 31b are perspective view  
30  photographs taken during installation of the ramp  
31  rails and switch rails of Fig. 29a;

1           Fig. 32a is a plan view showing the layout of  
2           the pot sleepers of Fig. 24c;

3           Fig. 32b is a plane view showing two pot  
4           sleeper arrangements of Fig. 24c connected by a  
5           rigid frame;

6           Fig. 32c shows an end, side, and plan view of  
7           the pot sleeper arrangement of Fig. 24c;

8           Fig. 33a is a perspective view showing the pot  
9           sleeper and rigid frame arrangements of Fig. 32b in  
10          their operational position;

11          Fig. 33b is a perspective view of the pot  
12          sleeper arrangement of Fig. 24c with a sample rail  
13          section fixed thereto;

14          Fig. 34a is side view of the pot sleeper  
15          arrangement of Fig. 24c with a sample rail section  
16          fixed thereto;

17          Fig. 34b is a perspective view showing the pot  
18          sleeper arrangement and switch rail of Fig. 24c in  
19          their operational positions;

20          Fig. 35a and 35b are perspective view  
21          photographs showing the layout of the pot sleeper  
22          arrangements of Fig. 24c;

23          Fig. 36a is a plan view of a crossover in  
24          accordance with the first and second aspects of the  
25          present invention, where the crossover rail is  
26          mounted on a support plate which is in a first  
27          configuration;

28          Fig. 36b is a plan view of the crossover rail  
29          and support plate of Fig. 36a;

30          Fig. 36c is a plan view of the crossover rail  
31          of Fig. 36a;

1           Fig. 36d is a cross-sectional view of the  
2 crossover rail of Fig. 36a;

3           Fig. 36e is a cross-sectional view of the  
4 crossover rail of Fig. 36a with the support plate  
5 and crossover rail hinged to one side in a second  
6 configuration;

7           Fig. 36f is an end view of the end of the  
8 crossover rail of Fig. 36a;

9           Fig. 37a is a plan view of a switch rail in  
10 accordance with the first and second aspect of the  
11 present invention, where the switch rail is mounted  
12 on a support plate which is in a first  
13 configuration;

14           Fig. 37b is a plan view of the switch rail and  
15 support plate of Fig. 37a;

16           Fig. 37c is a plan view of the switch rail of  
17 Fig. 37a;

18           Fig. 37d is a cross-sectional view of the  
19 switch rail of Fig. 37a;

20           Fig. 37e is a cross-sectional view of the  
21 crossover rail of Fig. 37a with the support plate  
22 and switch rail hinged to one side in a second  
23 configuration;

24           Fig. 38a is a plan view of a temporary non-  
25 intrusive turnout in accordance with a first aspect  
26 of the present invention;

27           Fig. 38b is a schematic diagram illustrating  
28 the height variation along the length of the  
29 temporary non-intrusive turnout of Fig. 38a;

30           Fig. 39a is transverse view of a ramp in  
31 accordance with the first and third aspect of the  
32 present invention;

1           Fig. 39b is a plan view of the ramp of Fig.

2   39a;

3           Fig. 39c is a cross sectional view illustrating  
4   train wheels being supported by the ramps of Fig.  
5   39a; and

6           Fig. 39d is a more detailed cross sectional  
7   view of the ramps of Fig. 39c.

8

9   Fig. 1 shows a non-intrusive turnout generally  
10   indicated as 10.. It will be appreciated by the  
11   reader that two spaced apart non-intrusive turnouts  
12   10 are utilised on a section of track to provide a  
13   non-intrusive crossover.

14

15   As shown in Fig. 1, the temporary non-intrusive  
16   turnout 10 links a south bound rail track 12 and a  
17   north bound rail track 14, such that a train (not  
18   shown) which has already been transferred from the  
19   south bound rail track 12 to travel south along the  
20   north bound rail track 14 can be transferred back  
21   onto the south bound rail track 12. In this manner,  
22   the portion of the south bound rail track 12' can be  
23   repaired/maintained. The skilled reader will  
24   realise that other routes of transfer could be  
25   installed and adopted.

26

27   The temporary non-intrusive turnout 10 comprises a  
28   number of components which will now be described.

29

30   The non-intrusive turnout 10 comprises a pair of  
31   turnout tracks 16, 18 and a plurality of temporary  
32   sleepers 20. For ease of reference, the turnout

1 track 16 will be referred to as the left hand  
2 turnout track 16 and the turnout track 18 will be  
3 referred to as the right hand turnout track 18.

4  
5 The left hand turnout track 16 comprises, from the  
6 left hand end of Fig. 1, a ramp rail 22L. The  
7 uppermost portion of the ramp rail 22L is wedge  
8 shaped, with the uppermost surface tapering linearly  
9 from its left most end which has a height of 0mm up  
10 to its right most end which has a height of  
11 approximately 50mm and this linear tapering can be  
12 best seen in Figs. 7B, 25A and 25B which shows that  
13 the ramp rail 22 has a sufficient length, in the  
14 region of 1700mm, such that the angle of tapering is  
15 relatively gradual. The ramp rail 22L is coupled to  
16 the north bound left hand rail track 14L by means of  
17 a G-clamp mechanism 32 as shown in Fig. 5; it should  
18 be noted however that other types of clamp  
19 mechanisms could be utilised. The ramp rail 22  
20 comprises a head portion 51 which rests on top of  
21 the upper flat surface of the rail track 12, 14. A  
22 neck portion 53 extends downwardly from the inner  
23 most edge of the head portion 51, where the neck  
24 portion 53 is shaped to substantially match the  
25 shape of the inside face of the rail track 12, 14.

26  
27 The G-clamp mechanism 32 comprises a G-shaped clamp  
28 34, one end of which surrounds and is compressed  
29 against, the opposite upstanding face of the rail  
30 track 12, 14 to the neck portion 53. A vice 36  
31 extends toward the neck portion 53 of the ramp rail  
32 22 from the other end of the G-shaped clamp 34, such

1 that the vice 36 can be forced or urged into secure  
2 connection with the neck portion 53. Preferably,  
3 the vice 36 is of a type that can be readily  
4 assembled and disassembled in a short amount of  
5 time.

6  
7 Following on from the ramp rail 22L from left to  
8 right, the left hand turnout track 16 next comprises  
9 a switch rail 24L, the left hand most end of which  
10 is arranged to butt against the right hand most end  
11 of the ramp rail 22L, as shown in Fig. 7b. As shown  
12 in Fig. 6, the switch rail 24L, 24R comprises a  
13 respective head portion 55L, 55R and the switch rail  
14 24L, 24R is inwardly curved along its length, toward  
15 the south bound rail track 12 and thus away from the  
16 north bound rail track 14. In other words, the end  
17 of the switch rail 24L adjacent to the ramp rail 22L  
18 is located directly above the north bound rail track  
19 14L whilst the opposite end of the switch rail 24L  
20 is displaced from the north bound rail track 14L.  
21 Nevertheless, the head portion 55L comprises a  
22 linear height of approximately 50mm arranged  
23 horizontally along its length. The switch rail 24L  
24 also comprises a neck portion 57L. Conveniently,  
25 and as shown in Fig. 4, the neck portion 57L may  
26 have a slot formed in it at the end of the switch  
27 rail 24L closest to the ramp rail 22L, such that the  
28 upper most portion of the north bound rail track 14L  
29 can protrude inwardly through said slot.  
30 Alternatively, the slot may be omitted, with the  
31 neck portion 57L following the shape of the inside  
32 face of the north bound rail track 14L. The switch

1 rail 24L is secured in a releasable fashion to the  
2 north bound rail track 14L by means of a G-clamp  
3 mechanism 62 which operates in a similar fashion to  
4 the G-clamp mechanism 32 of Fig. 5. The G-clamp  
5 mechanism 62 as shown in Fig. 4 comprises a similar  
6 G-shaped clamp 64 and a vice 66. The switch rail  
7 24L is supported at its middle and right hand most  
8 end from underneath by the G-clamp mechanism 62 and  
9 temporary sleepers 20. It should be noted that the  
10 term "inside face" is used in the sense that it is  
11 the face that the respective turnout track 16, 18 is  
12 being turned away from.

13  
14 Following on from the switch rail 24L from left to  
15 right, the left hand turnout track 16 next comprises  
16 a gutt rail 26L. The gutt rail 26L has an I-shaped  
17 cross-section which is broadly similar to the I-  
18 shaped cross-section of a normal rail track such as  
19 12, 14. The gutt rail 26L continues to bend at  
20 approximately the same radius as the bend radius of  
21 the switch rail 24L. The clamping mechanism of the  
22 gutt rail 26L to the north bound rail track 14L is  
23 similar to that as shown in Fig. 8 which will be  
24 described subsequently. Again, the gutt rail 26L is  
25 supported from underneath by the clamping mechanism  
26 and temporary sleepers 20 to have its upper flat  
27 horizontal surface to be approximately 50mm above  
28 the south bound 12 and hence north bound 14 rail  
29 tracks.

30  
31 Up until this point, the right hand turnout track 18  
32 substantially mirrors that of the left hand turnout

1 track 16, since the right hand turnout track 18  
2 comprises, from left to right in Fig. 1, a ramp rail  
3 22R, a switch rail 24R and a gutt rail 26R.

4  
5 The left hand turnout track 16 from left to right  
6 after the gutt rail 26L comprises a straight rail  
7 28L which thus has no bend radius and which once  
8 again is supported by the temporary sleepers 20 to  
9 have its upper flat horizontal surface to be  
10 approximately 50mm above the south bound 12 and  
11 hence north bound 14 rail tracks.

12  
13 Following immediately on from the straight rail 28L,  
14 the left hand turnout track 16 comprises a crossing  
15 rail 30L which is broadly similar to the crossing  
16 rail 30R which will be described subsequently.

17  
18 Immediately following on from the gutt rail 26R, the  
19 right hand turnout track 18 comprises a crossing  
20 rail 30R which is shown in more detail in Fig. 2 and  
21 Figs. 3A and 3B. The crossing rail 30R comprises a  
22 substantially I-shaped cross-section toward and at  
23 both its ends which is substantially the same I-  
24 shaped cross-section as the existing south bound 12  
25 and north bound 14 rail track. Thus, towards and at  
26 its ends, the crossing rail 30R comprises a head  
27 portion 59 and a neck portion 61. However, a slot  
28 or gap 31 is provided along a portion of the length  
29 of the crossing rail 30R about the mid point of the  
30 crossing rail 30R such that there is no neck portion  
31 61 in the region of the slot 31 as shown most  
32 clearly in Fig. 3B. The crossing rail 30R is



1 arranged to lie across the north bound rail track  
2 14L such that the north bound rail track 14L lies  
3 within the slot 31. Accordingly, since the crossing  
4 rail 30R is again supported from underneath by the  
5 temporary sleepers 20 to have its head portion 59  
6 with a height of approximately 50mm and since the  
7 crossing rail 30R is arranged to be horizontal, the  
8 upper most surface of the crossing rail 30R is  
9 approximately 50mm higher than the upper most  
10 surface of the south bound 12 and north bound 14  
11 rail tracks.

12

13 The right hand turnout track 18 next comprises from  
14 left to right and immediately after the crossing  
15 rail 30R, a straight rail 28R which is substantially  
16 identical in function and arrangement to the  
17 straight rail 28L previously described. Similarly,  
18 the crossing rail 30L is substantially identical to  
19 the crossing rail 30R in function and arrangement  
20 except that the crossing rail 30L crosses over the  
21 south bound rail track 12R.

22

23 The left hand turnout track 16 follows on from left  
24 to right after the crossing rail 30L with a gutt  
25 rail 42L which is followed by a switch rail 44L  
26 which is in turn followed by a ramp rail 46L which  
27 are respectively substantially identical to the gutt  
28 rails 26L, switch rail 24L and ramp rail 22L in  
29 function and arrangement.

30

31 The right hand turnout track 18 follows on from the  
32 straight rail 28R from left to right with a gutt

1 rail 22R which is followed by a switch rail 44R  
2 which is in turn followed by a ramp rail 46R which  
3 are respectively substantially identical in function  
4 and arrangement to the gutt rail 26R, the switch  
5 rail 24R and the ramp rail 22R.

6  
7 As shown in Fig. 8, the gutt rails 42L, 42R (and  
8 thus the gutt rails 26L, 26R) are clamped to the  
9 south bound rail tracks 12L, 12R by means of a J  
10 block arrangement 68L, 68R and a lengthened G-clamp  
11 mechanism 70L, 70R. The J block arrangement 68L and  
12 G-clamp mechanism 70L will now be described, but  
13 those skilled in the art will realise that the J  
14 block arrangement 68R and G-clamp mechanism 70R are  
15 substantially identical to the J block arrangement  
16 68L and G-clamp mechanism 70L except that they are  
17 rotated through 180°. The gutt rail 42L is spaced  
18 apart from the south bound rail track 12L by means  
19 of the J block arrangement 68L which is preferably  
20 formed from any hard material that is shaped to fit  
21 into the heart of the rail to maintain a set  
22 distance between the rails. As shown in Fig. 8, the  
23 J block arrangement 68L is arranged such that it not  
24 only spaces the gutt rail 42L horizontally apart  
25 from the south bound rail track 12L but it also  
26 spaces them vertically apart, such that the upper  
27 most horizontally arranged surface of the gutt rail  
28 42L is approximately 50mm vertically above the upper  
29 most horizontally arranged surface of the south  
30 bound rail track 12L. The G-clamp mechanism 70L  
31 clamps the gutt rail 42L to the south bound rail  
32 track 12L via the J block arrangement 68L and the G-

1 clamp mechanism 70L once again comprises a vice 76L  
2 or a bolted fixing through the rail 12L, 42L and J  
3 block arrangement 68L or similar arrangement.

4  
5 It should be noted that, as shown in Fig. 9A, the  
6 left hand 16 and right hand 18 turnout tracks may be  
7 provided with a pot sleeper arrangement 80, where  
8 the two pot sleeper arrangements 80L, 80R are  
9 coupled to one another via a rigid frame 82L, 82R,  
10 where the rigid frame 82L, 82R may be provided in  
11 two halves, 82L, 82R which are coupled to one  
12 another at their outer most ends via a suitable  
13 fixing means 84 such as nuts and bolts (not shown).  
14 Thus, the pot sleeper arrangement 80L, 80R can be  
15 used either to replace the temporary sleepers 20 (as  
16 shown in Figs. 32A and 33A) or could be provided on  
17 top of an in-situ or existing timber sleeper, in  
18 order to provide increased rigidity to the non-  
19 intrusive temporary turnout 10.

20  
21 The pot sleeper arrangement 80 is shown in more  
22 detail in Figs. 33B and 34A with a sample rail  
23 section 86 fixed in position. The beam section 84  
24 of the pot sleeper 80 has a hollow, inverted U-  
25 shaped cross section which is toed out at the  
26 lowermost end of each side of the inverted, U-shape  
27 to form lips 88. End plates 90 are attached to each  
28 end of the beam section 84 such that each end plate  
29 90 protrudes vertically downward past the lips 88,  
30 the downward projection typically being in the  
31 region of 100mm. The sample rail section 86 is  
32 connected to the beam section 84 by conventional

1 'Pandrol' clips 92 which are known widely in the  
2 railway industry.

3  
4 When the pot sleepers 80 are in position, the end  
5 plates 90 project into the ballast or stones (not  
6 shown in Fig. 33B) until the lips 88 are level with  
7 the ballast (not shown). This projection of the  
8 plates 90 provides increased lateral stability to  
9 the pot sleepers 80 in both the longitudinal and  
10 perpendicular directions with respect to the main  
11 axis of the pot sleepers 80, whilst keeping the mass  
12 of the pot sleeper arrangement 80 to a minimum. The  
13 lips 88 also create a larger surface area or  
14 footprint for the pot sleeper 80 which avoids it  
15 sinking into the ballast (not shown) beyond a  
16 satisfactory depth when a load is placed on the pot  
17 sleeper 80 (i.e. during the passing of a train 5).

18  
19 Fig. 10 shows a scale model of a non-intrusive  
20 turnout 10 part way through construction; it should  
21 be noted however that the scale model shown in Fig.  
22 10 omits the straight rails 28L, 28R and also the  
23 switch rails 44L, 44R but it is envisaged that the  
24 straight 28L, 28R and switch 44L, 44R rails would be  
25 used in a full size rail track 12, 14.

26  
27 Fig. 10 shows that a couple of temporary sleepers 20  
28 have been laid, and the gutt rails 42L, 42R have  
29 been secured to the temporary sleepers 20 and also  
30 secured to the south bound track 12L, 12R. It  
31 should also be noted that the gutt rails 42R are in  
32 essence longer versions of the switch rails 44L, 44R

1 in the model shown in Fig. 10 through Fig. 18. The  
2 crossover rail 30L has also been installed such that  
3 it crosses over the south bound rail track 12R.  
4 Fig. 11 shows that the gutt/switch rail 26L has been  
5 installed next and is followed by installation of  
6 the gutt/switch rail 26R in Fig. 12 and is followed  
7 by the crossover rail 30R as shown in Fig. 13.  
8 Thereafter, the ramp rails 22L, 22R are secured to  
9 the respective north bound rail tracks 14L, 14R.

10  
11 A model of a train 5 is shown in Fig. 15 as having  
12 travelled south along the north bound rail track 14  
13 and having mounted the ramp rails 22L, 22R. It is  
14 important to note that the ramp rails 22L, 22R raise  
15 the wheels of the train (not shown) and thus the  
16 model train 5 by an amount sufficient such that the  
17 flanged part of the wheel is just vertically above  
18 the height of the rest of the normal track 14L, 14R.  
19 Thus, and as shown in Fig. 16, when the model train  
20 5 moves onto the crossing rails 30L, 30R, the left  
21 hand 16 and right hand 18 turnout tracks are of a  
22 sufficient height such that the flanged part of the  
23 wheel 7, which normally acts to keep the model train  
24 5 and thus full size trains on the tracks, is able  
25 to clear the north bound rail track 14L and then the  
26 south bound rail track 12R. The model 5 is shown in  
27 Fig. 17 as continuing through the non-intrusive  
28 temporary turnout 10 until it reaches the position  
29 shown in Fig. 18 which shows the model 5 about to  
30 travel down the ramp rails 46L, 46R and then onward  
31 as per normal south along the south bound rail track  
32 12.

1 The non-intrusive turnout 10 previously described  
2 herein has the great advantage that the rail tracks  
3 12R and 14L do not require to be cut which would be  
4 normal if a conventional intrusive temporary turnout  
5 was to be inserted in to the tracks 12, 14.  
6 Furthermore, those skilled in the art will  
7 appreciate that, if a train requires to pass through  
8 the non-intrusive temporary turnout 10 without  
9 actually crossing over from one track 12 onto  
10 another track 14, the ramp rails 22 or 46 as  
11 required can be removed along with the respective  
12 switch rails 24 or 44 and crossing rail 30L or 30R  
13 and as such the train will be able to bypass the  
14 non-intrusive temporary turnout 10.

15  
16 An alternative non-intrusive turnout will now be  
17 described with reference to Figs. 19 to 35.

18  
19 The sequence of rail components length wise along  
20 the track of the turnout of Figs. 19 to 35 is the  
21 same as that for the non-intrusive turnout (Fig. 1)  
22 i.e. from the left hand end of the left hand turnout  
23 track 16, a pair of ramp rails 21, 22 followed by a  
24 pair of switch rails 23, 24 followed by a pair of  
25 gutt rails 25, 26, followed by a pair of crossing  
26 rails 29, 30 etc.

27  
28 The ramp rails 21, 22 and the means of connecting  
29 the ramp rails 21, 22 (G-clamp mechanism 32,  
30 represented by 32 in Fig. 26) in this alternative  
31 are broadly similar to that of the previous non-

1 intrusive turnout, and thus require no further  
2 description.

3

4 Following on from the ramp rails 21, 22, Figs 19A  
5 and B along with Figs. 24A, B , C) shows a pair of  
6 switch rail units generally designated 100  
7 comprising a switch rail head 50, planar member or  
8 plate 38, guide means 60 in the form of downwardly  
9 projecting guide flanges 60, a pair of supporting  
10 members 40, end plate 72, and support connecting  
11 means 48 in the form of clips 48.

12

13 The switch rail head 50 essentially takes the form  
14 of an upper portion of an I-shaped rail section  
15 (shown during installation of the apparatus in Figs.  
16 31A and B), and extends between one end of the  
17 switch rail unit 100 and the other. The switch rail  
18 head 50 is inwardly curved along its length toward  
19 the south bound rail track 12 and thus away from the  
20 north bound rail track 14, in a broadly similar  
21 manner to that previously described (Fig. 1).

22

23 The planar member or plate 38 is rectangular in  
24 dimension and is permanently attached to the switch  
25 rail head 50 by any suitable means during  
26 manufacture such as welding or moulding etc. The  
27 plate 38 may or may not extend along the full length  
28 of the switch rail unit 100; in the latter case, the  
29 switch rail head 50 will overhang the plate member  
30 38. This is best seen in Figs. 27A and 28A.

31

1 The pair of guide flanges 60 project downwardly from  
2 the plate 38 and run parallel to the existing north  
3 bound track 14 along the entire length of the switch  
4 rail unit 100 and are displaced from the centreline  
5 or the plate 38 by an amount which allows the inner  
6 track of the existing north bound track 14 to fit  
7 closely between the pair of guide flanges 60. The  
8 skilled reader will realise that the guide flanges  
9 60 may only be present at the extreme ends of the  
10 plate 38.

11  
12 Each supporting member 40 may be a wooden timber and  
13 has a cross sectional shape which allows them to be  
14 placed underneath the plate 38 and close around the  
15 inner and outer neck portions of the existing rail.  
16 The lower surface of each supporting member 40  
17 together may also be adapted, during manufacture or  
18 upon installation, to match the contours of a  
19 variety of standard railway sleepers. The pair of  
20 supporting members 40 are of a length, width and  
21 position, substantially similar to that of the  
22 plate 38, though it will be appreciated that longer  
23 and or wider supporting members may be preferable  
24 depending upon the individual situation parameters,  
25 for example the alignment and or size of the gaps  
26 between sleepers.

27  
28 The clips 48 releasably attach the pair of  
29 supporting members 40 to the plate 38, and are  
30 designed such that they will hold the supporting  
31 members 40 firmly against the planar member 38 in



1 the vertical direction, and against the existing  
2 rail in the lateral direction.

3  
4 The end plate 72 protrudes vertically downward from  
5 the overhang created by the switch rail head 50 and  
6 butts against the end of the inner supporting member  
7 40.

8  
9 It will be appreciated by the reader that in this  
10 embodiment the supporting members 40 may be left in  
11 position during normal running of the railway track  
12 (as shown in Figs. 29A, B, C, D, E and F); that is  
13 when no transfer of trains between one railway track  
14 and another is required, so that there is no  
15 crossover of a train 5 travelling on either north  
16 bound track 14 or south bound track 12.  
17 Alternatively the supporting members 40 may be  
18 placed to one side ready for installation as shown  
19 in Fig. 29G. Therefore the switch rail head 50 and  
20 planar member 38 may be installed and removed with  
21 relative ease and in a relatively short amount of  
22 time as desired.

23  
24 Following on from the switch rail unit 100 the  
25 turnout next comprises a pair of gutt rails 25, 26.  
26 The gutt rails 25, 26 are broadly similar to that  
27 previously described, and thus require no further  
28 description.

29  
30 Following on from the gutt rails 25, 26, the turnout  
31 next comprises a pair of crossing units generally  
32 designated 200 (Figs. 20A, B and Fig. 30). Each

1 crossing unit 200 comprising a crossing rail head  
2 50c, planar crossing member or plate 38c, guide  
3 flanges 60c, a pair of supporting members 40c, a  
4 pair of end plates 72c, and support connecting clip  
5 48c.

6  
7 The crossing rail head 50c has the same cross  
8 sectional shape as that of the switch rail 50, (i.e.  
9 upper portion of an I-shaped rail section), and  
10 extends diagonally between one end of the crossing  
11 unit 200 and the other, so as to point toward the  
12 south bound track 12 and thus away from the north  
13 bound track 14.

14  
15 The crossing rail head 50c may span a longer  
16 distance along the crossing unit 200 than the  
17 crossing plate 38c and the supporting members 40c,  
18 thus creating an overhang at either or both ends of  
19 the crossing unit 200.

20  
21 The crossing plate 38c, guide flanges 60c,  
22 supporting members 40c, and support connecting  
23 clips 48c are broadly similar to those of the switch  
24 rail unit 100, and thus require no further  
25 description.

26  
27 The pair of end plates 72c protrude vertically  
28 downward from the overhang created by the crossing  
29 rail head 50c. Each end plate butts against the end  
30 of a supporting member 40c.

31

1 The end plates 72 of the switch rail head 50, and  
2 the end plates 72c of the crossing rail head 50c may  
3 be drilled to suit a standard connecting means such  
4 as a fishplate, in order to provide a secure  
5 connection between each rail head component.

6  
7 This non-intrusive turnout 10 has an advantage over  
8 the previous alternative non-intrusive turnout 10 of  
9 having additional support to the turnout track which  
10 is provided by the supporting members 40, 40c whilst  
11 still allowing the switch rail head 50, crossing  
12 rail 50c, plate 38, and crossing plate 38c to be  
13 removed and installed relatively easily, without  
14 permanent alteration (i.e. cutting) of the existing  
15 track.

16  
17 Fig. 21A and B show an alternative version of the  
18 crossing unit of a non-intrusive turnout, which will  
19 now be described.

20  
21 A partially supported crossing unit generally  
22 designated 300 comprises a crossing rail head 50d,  
23 and a tapered supporting member 40d.

24  
25 The crossing rail head 50d is broadly similar to  
26 that previously described e.g. 50c and thus requires  
27 no further description.

28  
29 The tapered supporting member 40d is wedge shaped  
30 such that it fits in the gap created between the  
31 crossing rail 50d and the existing rail near the  
32 point of crossing over.

1 For each previously described non-intrusive turnout  
2 10, when the ramp rails 21, 22, switch rails 23, 24,  
3 and crossing rails 29, 30 are removed it is  
4 preferable that the end of each gutt rail 25, 26  
5 exposed to an oncoming train is provided with  
6 deflecting means which deflect any loose items (not  
7 shown) suspended below the railway carriage (not  
8 shown) away from the gutt rails 25, 26, thereby  
9 preventing such items from snagging on the gutt  
10 rails 25, 26 which could otherwise result in  
11 derailment of the railway carriage. Figs. 21A, B, C  
12 and D show possible deflecting means for this  
13 purpose. Each deflecting means is adapted to be  
14 easily fitted onto the exposed end of the gutt rails  
15 25, 26 by suitable means, for example a fishplate.  
16 Prior to re-installation of the ramp rails 21, 22,  
17 switch rails 23, 24, and crossing rails 29, 30, the  
18 deflecting means will be removed.

19  
20 Fig. 23A and B show alternative supporting means for  
21 a switch rail and crossing unit of a non-intrusive  
22 turnout, which will now be described.

23  
24 Central level crossing support members 40e known and  
25 used in the industry are wedged between the existing  
26 rails and are supported by central supports 78c  
27 which are connected to the existing sleeper 79. The  
28 central level crossing support members 40e are  
29 complimented by outer level crossing support members  
30 400e which are supported by outer supports 78o.  
31 Positioned between the outer level crossing support  
32 members 400e and the inner level crossing support

1 members 40e are outer packing wedges 120 and inner  
2 packing wedges 121. The outer and inner packing  
3 members 120, 121 secure the level crossing members  
4 40e, 400e in both the lateral and vertical  
5 directions.

6  
7 The switch rail head 50e and planar member 38e are  
8 broadly similar to that described previously (Fig.  
9 19) and are situated above the level crossing  
10 support members 40e and 400e.

11  
12 A similar adaptation is shown in Figs. 23C and D  
13 making use of the level crossing supports 40e and  
14 400e in the crossing rail unit.

15  
16 This support arrangement has the advantage over the  
17 support arrangements previously described in that it  
18 allows the loads exerted by the passing train to be  
19 transferred directly to the sleeper and existing  
20 rail, whilst using currently available components.

21  
22 However, it would be beneficial to reduce the height  
23 of certain portions of the raised track surface,  
24 specifically those portions which are intended to  
25 remain in place between the pair or existing rails  
26 in order to ensure that trains which pass along the  
27 existing rails during normal running do not collide  
28 with the raised track surface.

29  
30 Referring to Figs. 36a, 36b, 36c, 36f, 37a, 37b,  
31 37c, 38a, and 38b a first embodiment of non  
32 intrusive crossover apparatus 500 (Fig. 38a) in

1 accordance with the first, second and third aspects  
2 of the present invention will now be described.

3  
4 The sequence of rail components length wise along  
5 the track of the turnout of Figs. 19 to 35 is the  
6 similar to that previously described with the  
7 important difference of providing additional ramp  
8 sections along the length of the crossover in order  
9 to vary the height of the wheels as they are  
10 crossing the railway tracks. From the left hand end  
11 of the left hand turnout track 516L, a pair of ramp  
12 rails 522L, 522r are followed by a pair of switch  
13 rails 524L, 524r which have downwardly sloped ramp  
14 portions 600 followed by a pair of gutt rails 525L,  
15 525r which are at a lower height (typically a  
16 maximum of 25mm above the uppermost surface of  
17 existing rails 514 or 512) than the raised portions  
18 which pass over the existing rails 514L, 514r. Up  
19 until this point the right hand turnout track 516r  
20 is substantially the same as the left hand turnout  
21 track 516L. At this point the right hand turnout  
22 track 516r then joins with upwardly sloped ramp  
23 portion 602 of crossing unit 530r which rises to the  
24 height required in order to cross the existing track  
25 514L which is typically 50mm above the uppermost  
26 surface of existing rails 514 or 512. In order to  
27 avoid a discrepancy between the height of the raised  
28 track surface on the left hand side and that on the  
29 right hand side it is necessary to provide  
30 compensation ramps 604 on the left hand raised track  
31 surface. At this point the crossover repeats this  
32 process in a mirror image to that described in order

1 to return the raised track to the opposite side of  
2 the railway tracks 512l, 512r. The profile of this  
3 undulation in height is illustrated by Fig. 38b.

4  
5 The means of connecting the ramp rails 522L, 522r  
6 (G-clamp mechanism 32, represented by 32 in Fig. 26)  
7 in this embodiment are broadly similar to that of  
8 the previous described non-intrusive turnout, and  
9 thus requires no further description. However, an  
10 alternative embodiment of the ramp rails in  
11 accordance with the third aspect of the present  
12 invention will be described subsequently.

13  
14 Following on from the ramp rails 522L, 522r, Figs  
15 37a, 37b and 37c show a switch rail unit generally  
16 designated 524 comprising a switch rail head 550,  
17 planar support member or support plate 538, guide  
18 means 560 in the form of downwardly projecting guide  
19 flanges 560, a pair of supporting members 540, end  
20 plate 572, and support connecting means 548 in the  
21 form of clips 548.

22  
23 The switch rail head 550 essentially takes the form  
24 of an upper portion of an I-shaped rail section and  
25 extends between one end of the switch rail unit 524  
26 and the other. The switch rail head 550 is inwardly  
27 curved along its length toward the south bound rail  
28 track 512 and thus away from the north bound rail  
29 track 514, in a broadly similar manner to the that  
30 previously described (Fig. 1). The switch rail head  
31 550 has a downwardly sloped portion 600 at the end  
32 of the unit 524.

1 The planar support member or support plate 538,  
2 guide flanges 560, support members 540, clips 548  
3 and end plates 572 are substantially identical to  
4 that previously described and therefore will not be  
5 described further.

6  
7 Following on from the switch rail unit 524 the  
8 turnout next comprises a pair of gutt rails 525L,  
9 525r. The gutt rails 525L, 525r are located at a  
10 height and location which coincides with the lower  
11 end of the downwardly sloped portion 600 of the  
12 switch unit 524.

13  
14 On the right hand turnout rail 516r, following on  
15 from the gutt rails 525r the turnout next comprises  
16 a crossing unit generally designated 530 (Figs. 36a,  
17 36b, 37c). Each crossing unit 530 comprising a  
18 crossing rail head 550c, planar crossing member or  
19 plate 538c, guide flanges 560c, a pair of supporting  
20 members 540c, a pair of end plates 572c, and support  
21 connecting clip 548c.

22  
23 The planar member or plate 538c, guide flanges 560c,  
24 support members 540c, clips 548c and end plates 572c  
25 are substantially identical to that previously  
26 described and therefore will not be described  
27 further.

28  
29 The provision of the ramp rails 522L, 522r, switch  
30 rail 524L, 524r, downwardly sloped ramped portion  
31 600, gut rails 525L, 525r, crossing unit 530r and  
32 compensation ramps 604 of the turnout section



1 provides, when connected to another oppositely  
2 arranged turnout section, a raised surface which  
3 allows the train to travel from the first railway  
4 track 514 to the second railway track 512 as  
5 follows:-

6       The wheels are firstly raised (by about 50mm)  
7 by ramps 522L, 522r onto switch rails 524L, 524r  
8 which moves the wheels (and hence the train) away  
9 from the existing rails 514L, 514r. This  
10 effectively allows the flange of the wheel running  
11 along the left hand rail to pass over the left hand  
12 existing rail 514L;

13       Ramp portions 600 then lower (by approximately  
14 25mm) the wheels onto gutt rails 516L, 516r which  
15 transport the wheels further from the existing rails  
16 514L, 514r;

17       The wheels are then raised (by about 25mm) back  
18 up to the height which is substantially the same  
19 height as that at which the left hand wheel  
20 previously crossed the existing rail 514L. This now  
21 has the effect of allowing the flange of the right  
22 hand wheel to pass over the left hand existing rail  
23 514L.

24       The wheels then continue until the left hand  
25 wheel passes over existing rail 512r;

26       The wheels are then lowered (by about 25mm) on  
27 ramp portions equivalent to 600 on the opposite end  
28 of the non intrusive crossover section;

29       The wheels are then brought toward the second  
30 railway tracks 512L, 512R by gutt rails 542L, 542r;  
31 The wheels are then raised again (by about 25mm) via  
32 ramp portions 600B such that the flange of the right

1 hand wheel running along the right hand gutt rail  
2 542r may pass over existing rail 512r; and  
3 the wheels are finally lowered (by about 50mm)  
4 onto existing track 512l and 512r by ramp portions  
5 523L and 523r.

6  
7 Referring to Figs. 36e and 37e an embodiment of non  
8 intrusive crossover in accordance with a second  
9 aspect of the present invention will now be  
10 described.

11  
12 In this embodiment essentially the same switch  
13 apparatus is provided as previously described for  
14 the first embodiment with the important difference  
15 that a hinging mechanism 700 is provided in order to  
16 hinge the planar plate 1538 and the switch rail 1550  
17 away from the supporting members 1540 when normal  
18 running is desired; in other words the planar plate  
19 1538 can be rotated about the hinge mechanism 700  
20 from a first configuration in which the turnout is  
21 in operation to a second configuration in which the  
22 planar plate 1538 is clear of the existing rails and  
23 thus normal running of trains on the existing rails  
24 can occur. In the same way, hinging means 700 may  
25 be provided on the crossover apparatus in order to  
26 hinge the planar plate 1538c and the crossover rail  
27 1550c away from the supporting members 1540c when  
28 normal running is desired.

29  
30 Referring to Figs. 39a, 39b, 39c and 39d an  
31 embodiment of the ramp apparatus in accordance with

1 a third aspect of the present invention will now be  
2 described.

3  
4 The ramp apparatus generally designated 522 is  
5 secured to the outer edge of an existing rail 514  
6 and which is thus arranged on one side thereof by  
7 clamps 576 in a similar manner as that previously  
8 described. The ramp comprises a sloped portion 513  
9 and a levelled portion 515 which are integrally  
10 formed on a single member and which provide a rail  
11 surface for a tread of the wheels to traverse. The  
12 sloped portion 513 is provided with an introductory  
13 or lead-in slope 517 which extends below the level  
14 of the existing rail 514 on its outer edge. As  
15 shown in Fig. 39b, the sloped portion 513 is tapered  
16 to as low a height as possible (such as 10mm or so)  
17 where it abuts against the upper surface of the  
18 existing rail 514, though it will be appreciated by  
19 the skilled reader that it is not possible to have  
20 no height at the end of the taper especially since  
21 such a thin area would be liable to succumb to  
22 damage due to the train passing over it. In order  
23 to mitigate this problem in addition to being  
24 tapered with respect to height, the tapered end of  
25 the sloped portion 513 is also angularly tapered  
26 over the surface of the existing rail 514.

27  
28 It will be understood by those skilled in the art  
29 that train wheels 507 generally have a slightly  
30 greater width than the rails on which they are  
31 designed to run and therefore an overhang portion  
32 (in the order of a few mm) is created (not shown)

1 where the outer edge of the wheel tread 509 does not  
2 come into contact with the existing track 514  
3 surface.

4  
5 In operation, as the wheels 507 of the train pass  
6 along the existing rail 514 and toward the ramp 522  
7 the overhang portion on the wheels 507 will be  
8 gradually introduced to the ramp by the introductory  
9 slope 517. Thus when the rest of tread 509 of the  
10 wheel abuts against the taper of the sloped portion  
11 513 there will be a smooth transition from the  
12 existing rail 514 to the slope 513 and on towards  
13 the levelled portion 515. This is beneficial since  
14 it minimises the damage to the tapered portion of  
15 the ramp 522.

16  
17 It should be noted that the embodiments of the  
18 invention described allow a train to be transferred  
19 from a first railway track to a second railway track  
20 without permanently damaging either the first or  
21 second railway tracks, and that the invention  
22 described allows particular sections of the non-  
23 intrusive crossover section to be left in position  
24 during normal running of the track i.e. when it is  
25 not desired to transfer the train from the first to  
26 the second track. The embodiments described also  
27 allow those sections to be left in place without  
28 contravening specific requirements relating to the  
29 height (such as 25mm) which components protrude  
30 above the ground during normal running.  
31

- 1 Modifications and improvements may be made to the
- 2 embodiments described herein without departing from
- 3 the scope of the invention.

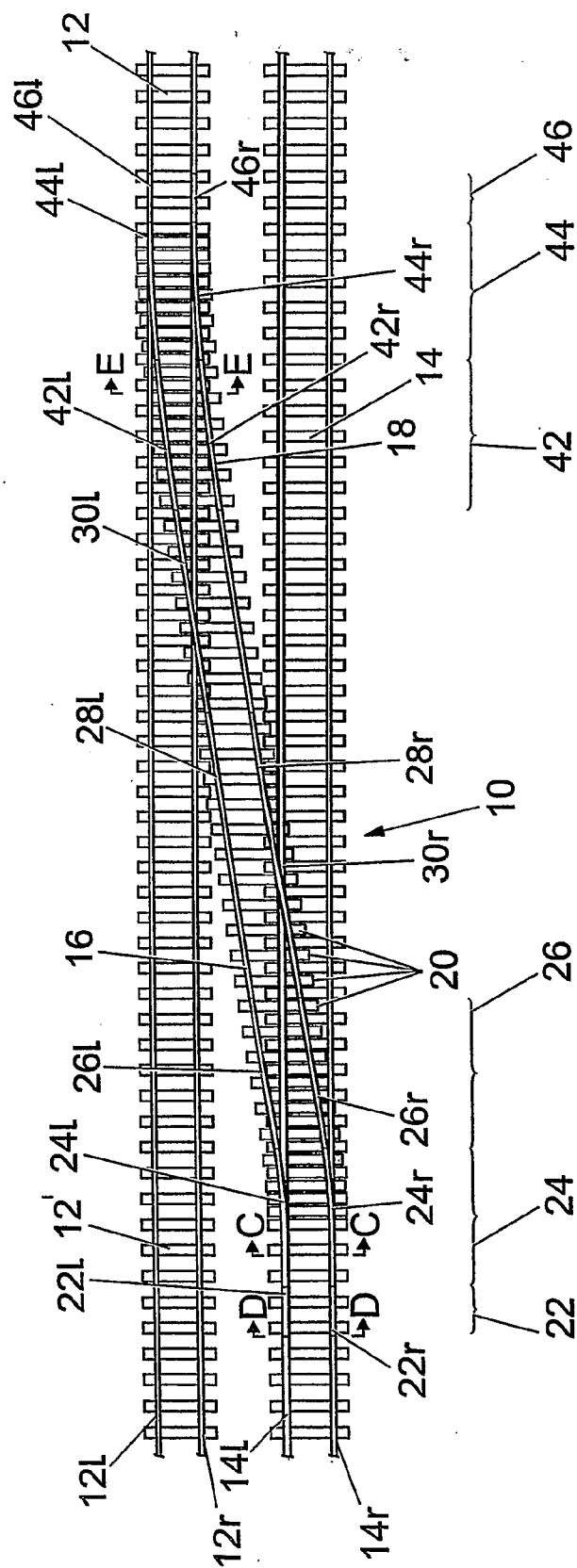
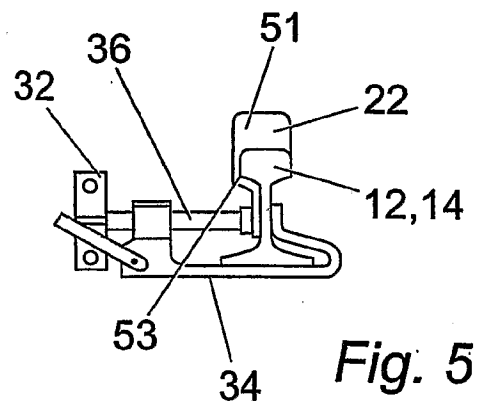
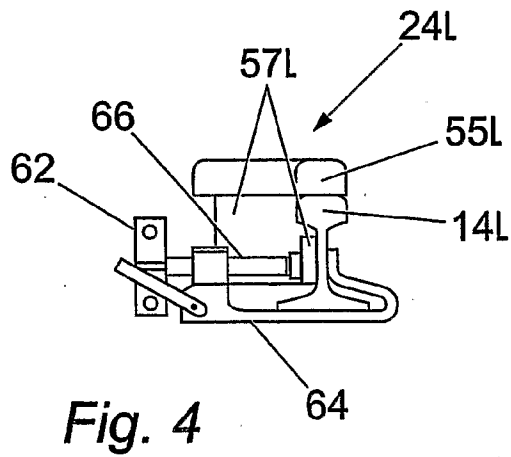
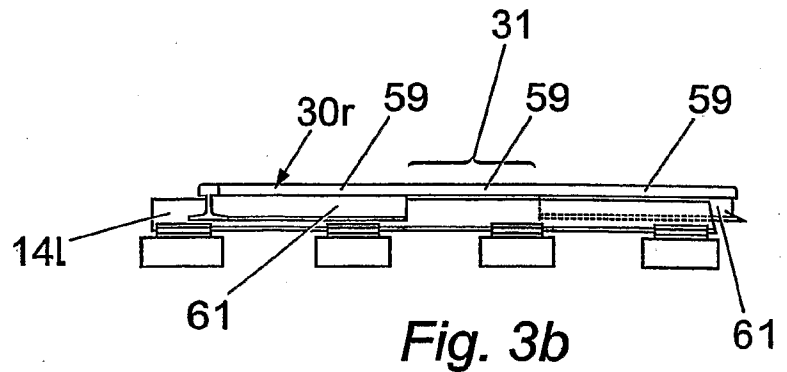
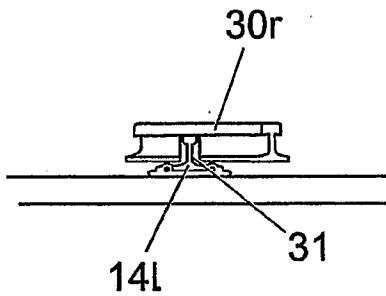
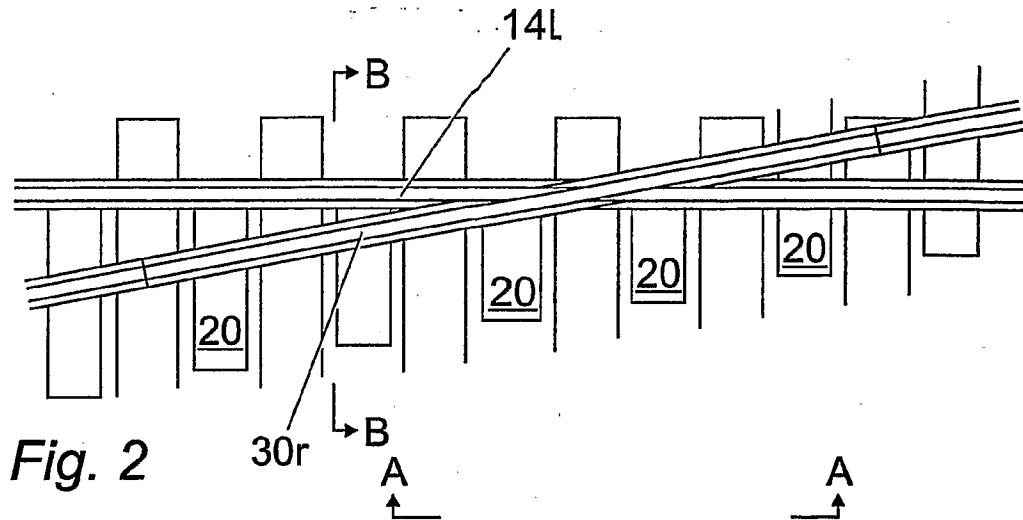


Fig. 1









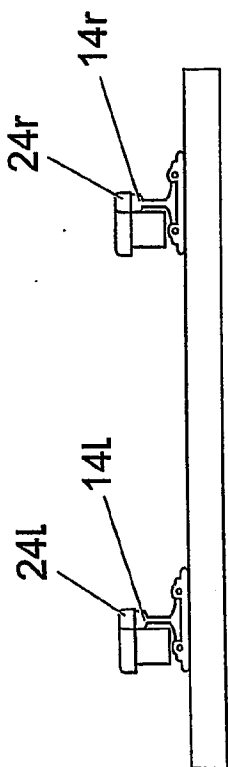


Fig. 6

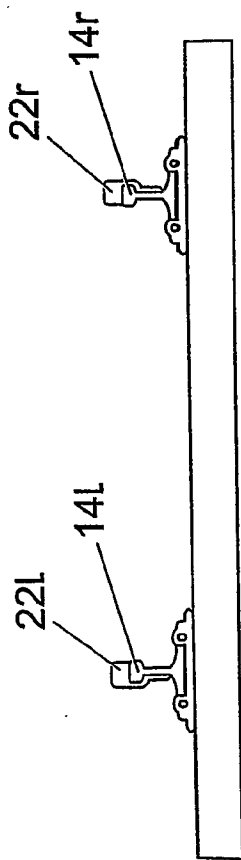


Fig. 7a

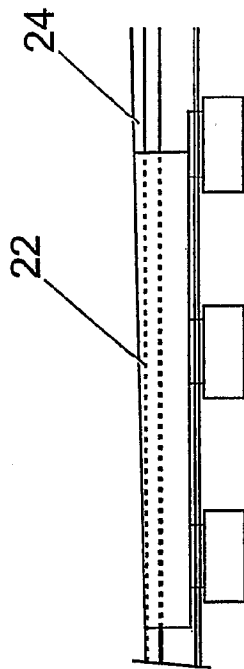


Fig. 7b

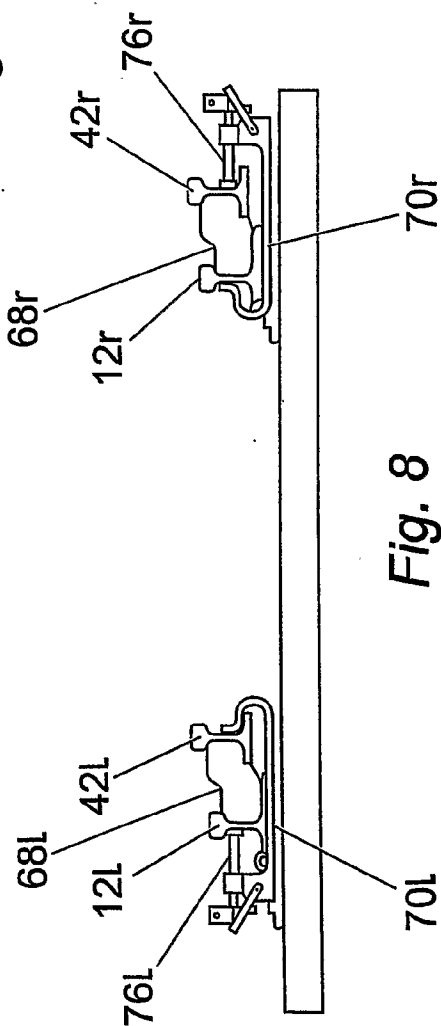


Fig. 8



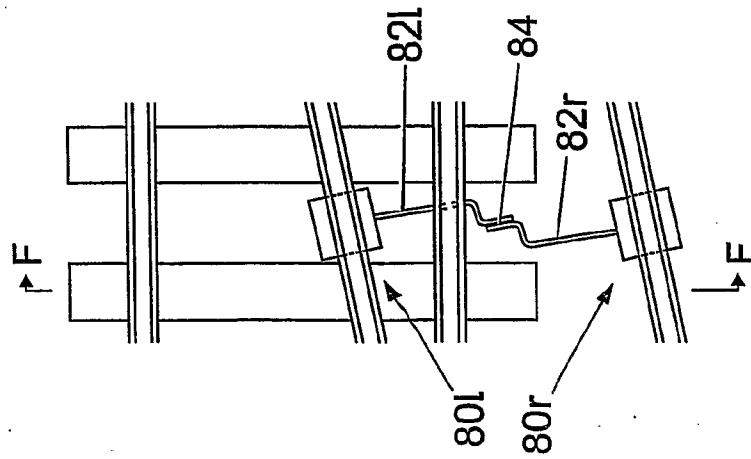


Fig. 9a

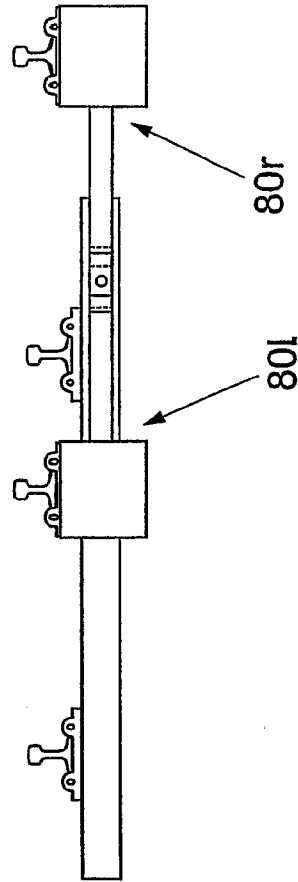


Fig. 9b



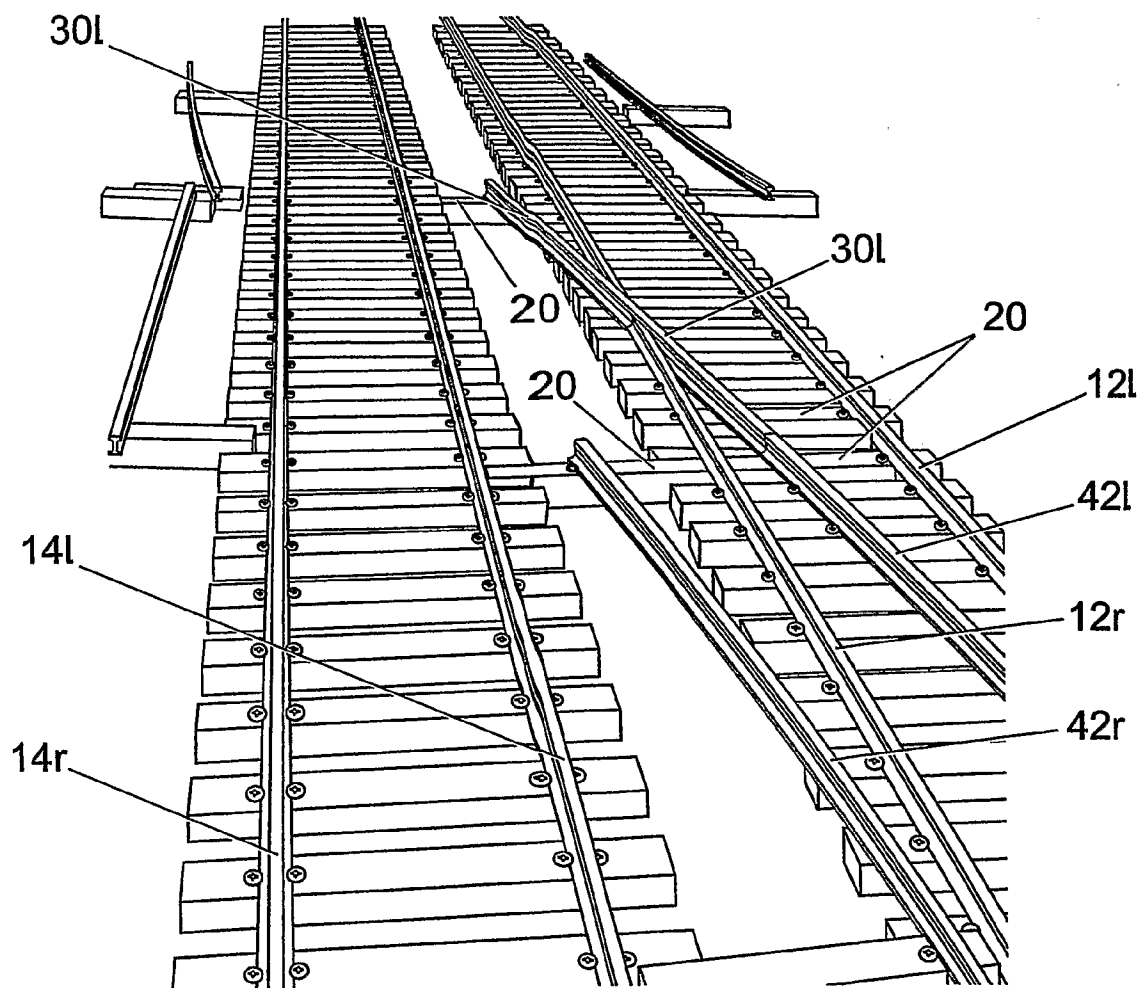


Fig. 10



6/34

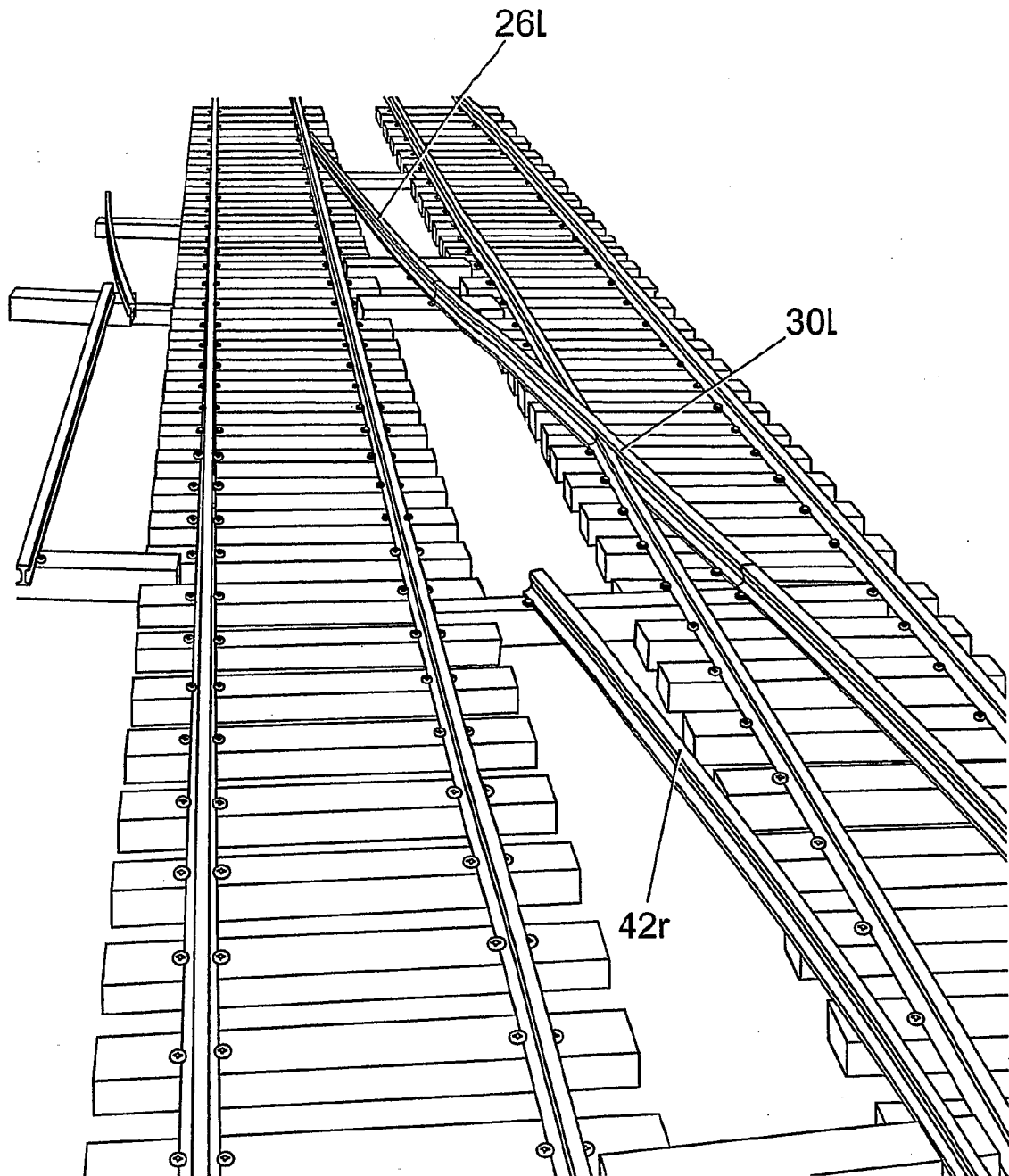


Fig. 11





7 / 38

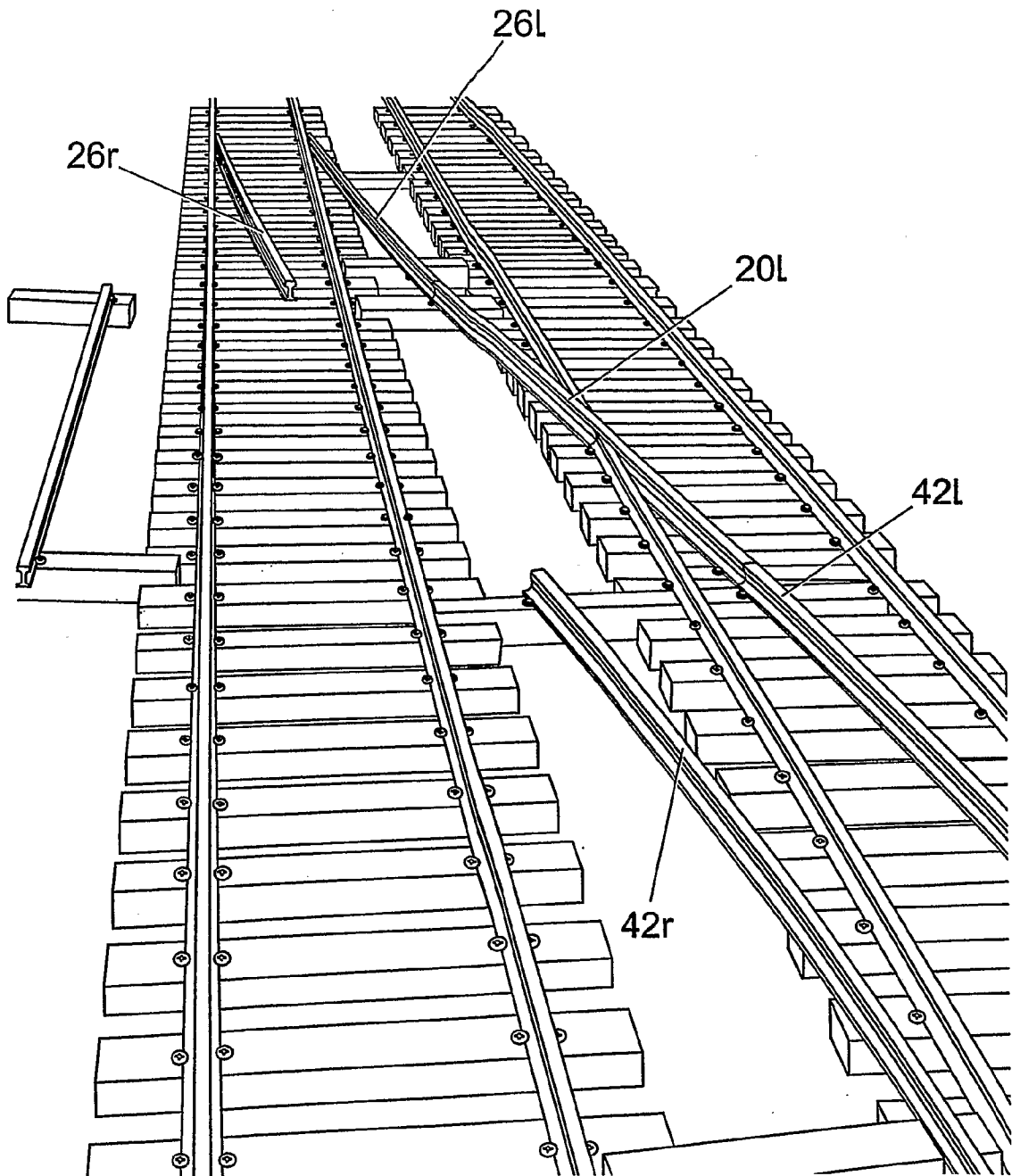


Fig. 12



8/38

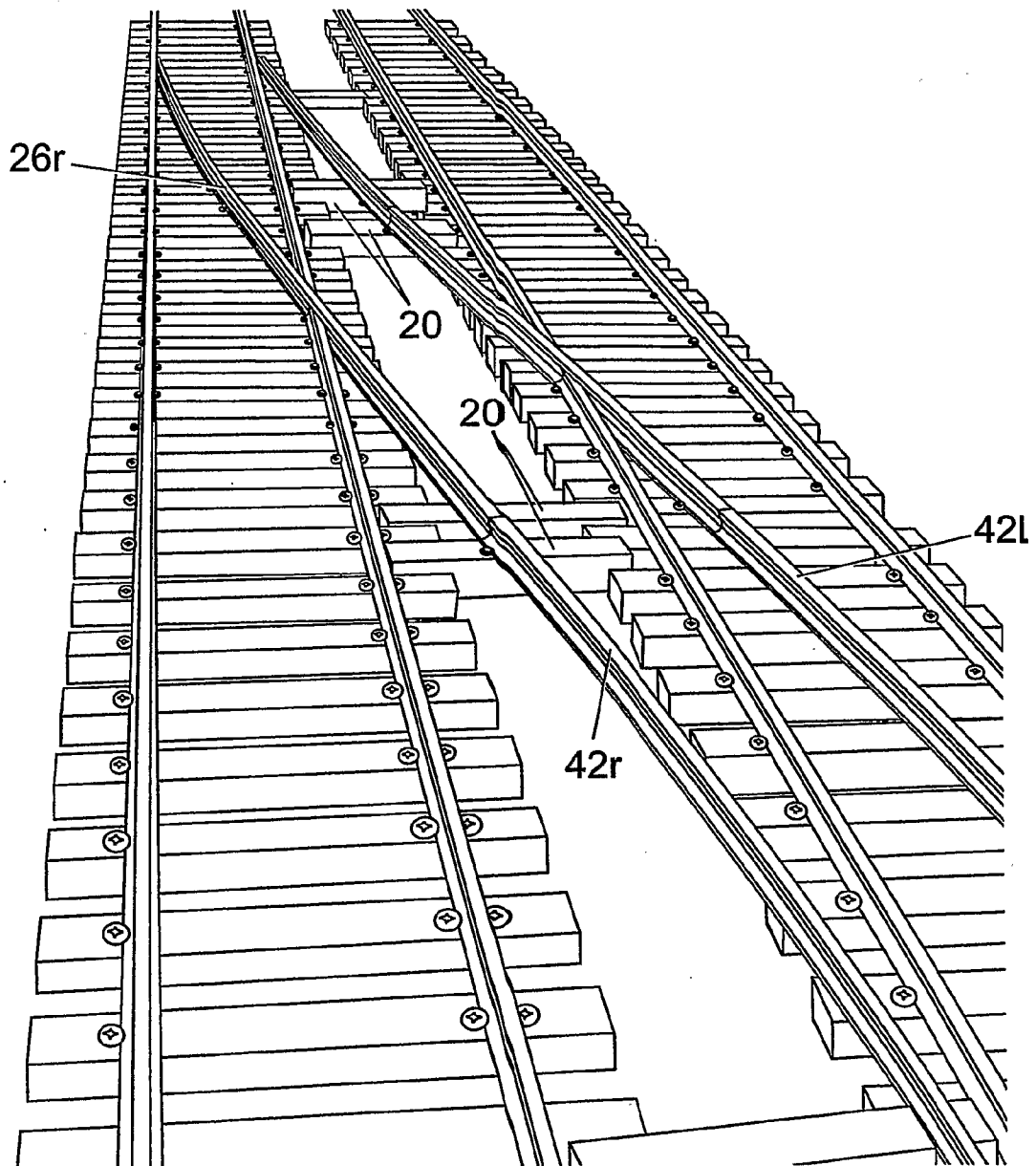


Fig. 13



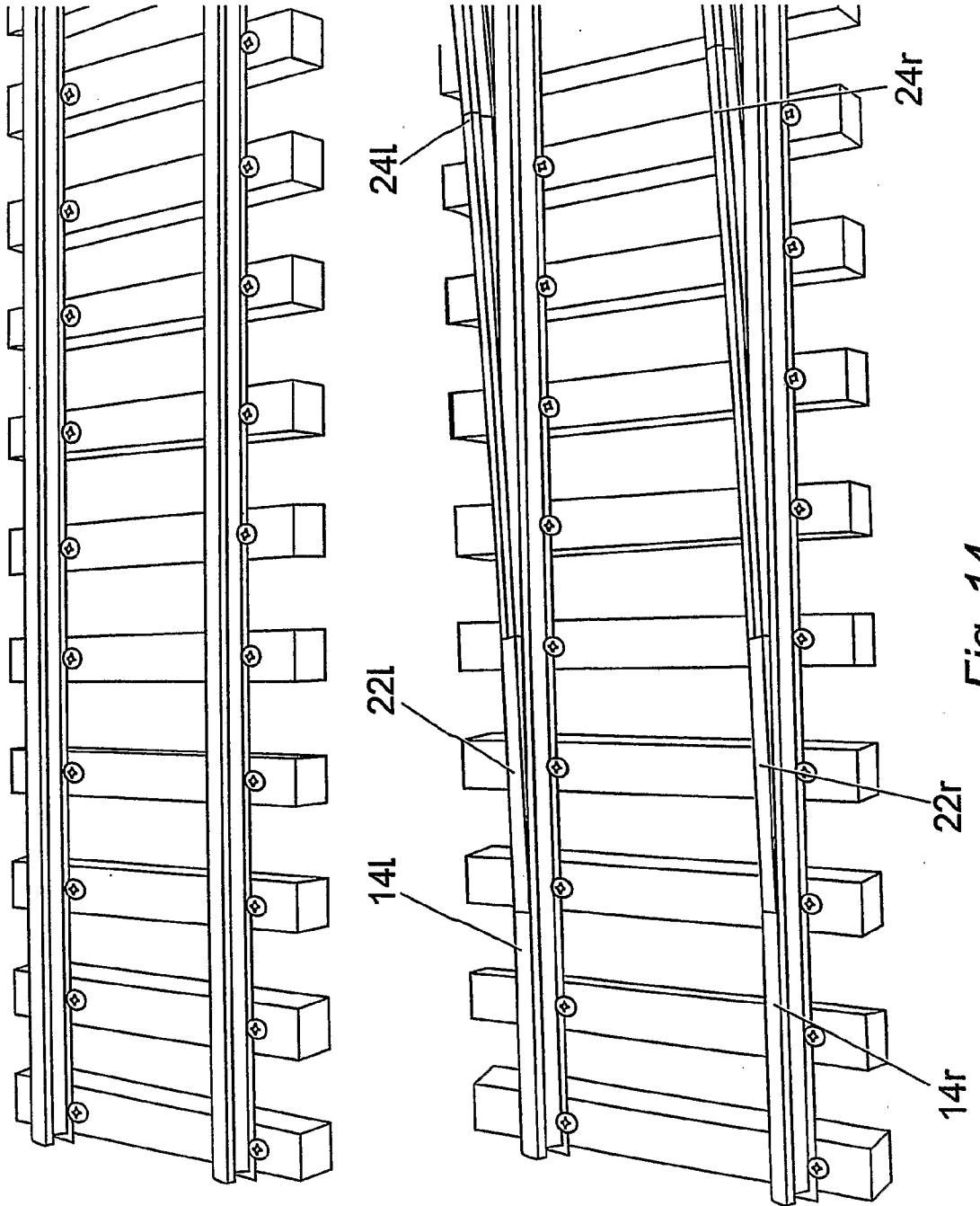


Fig. 14



10/38

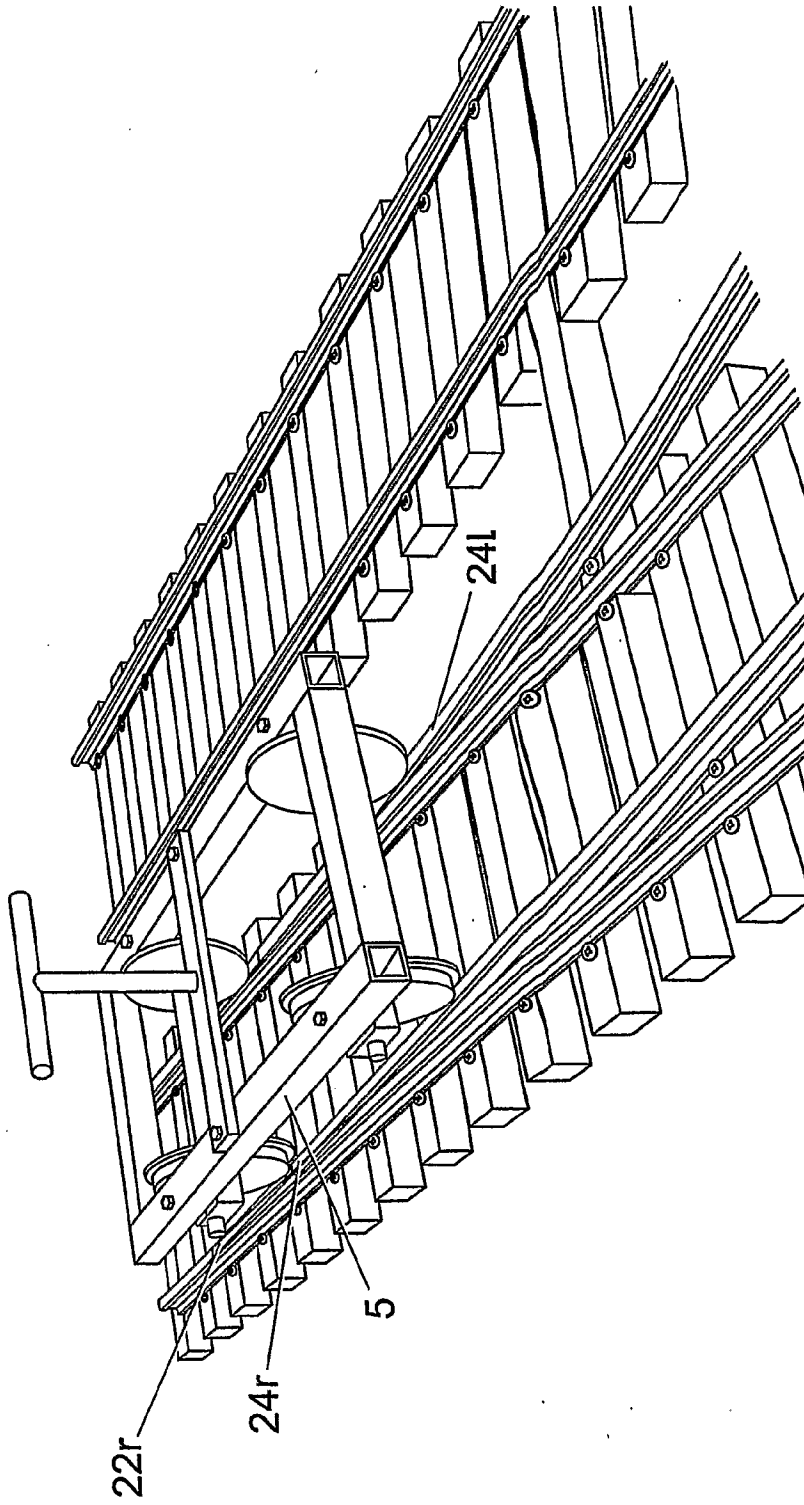


Fig. 15





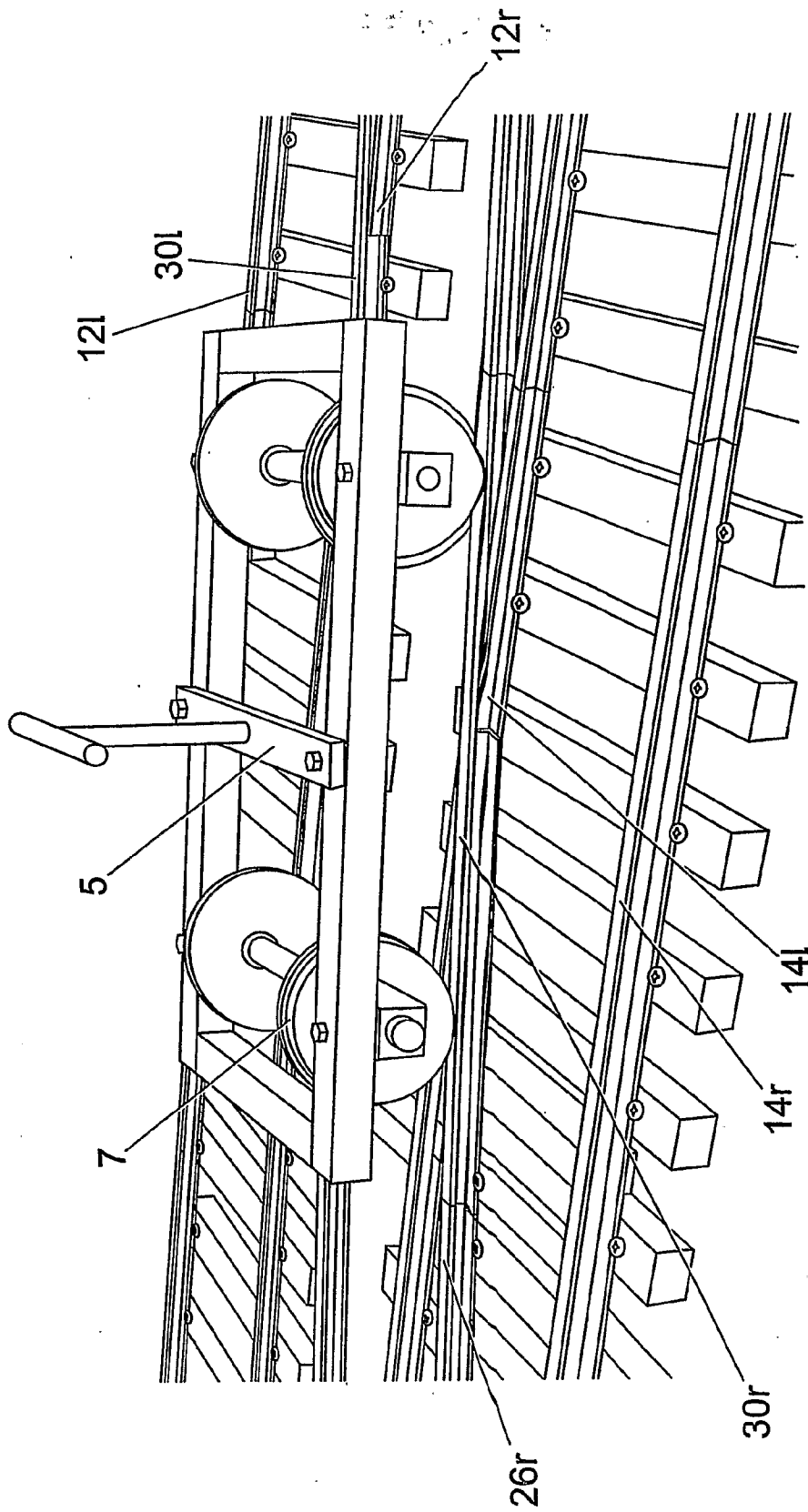


Fig. 16



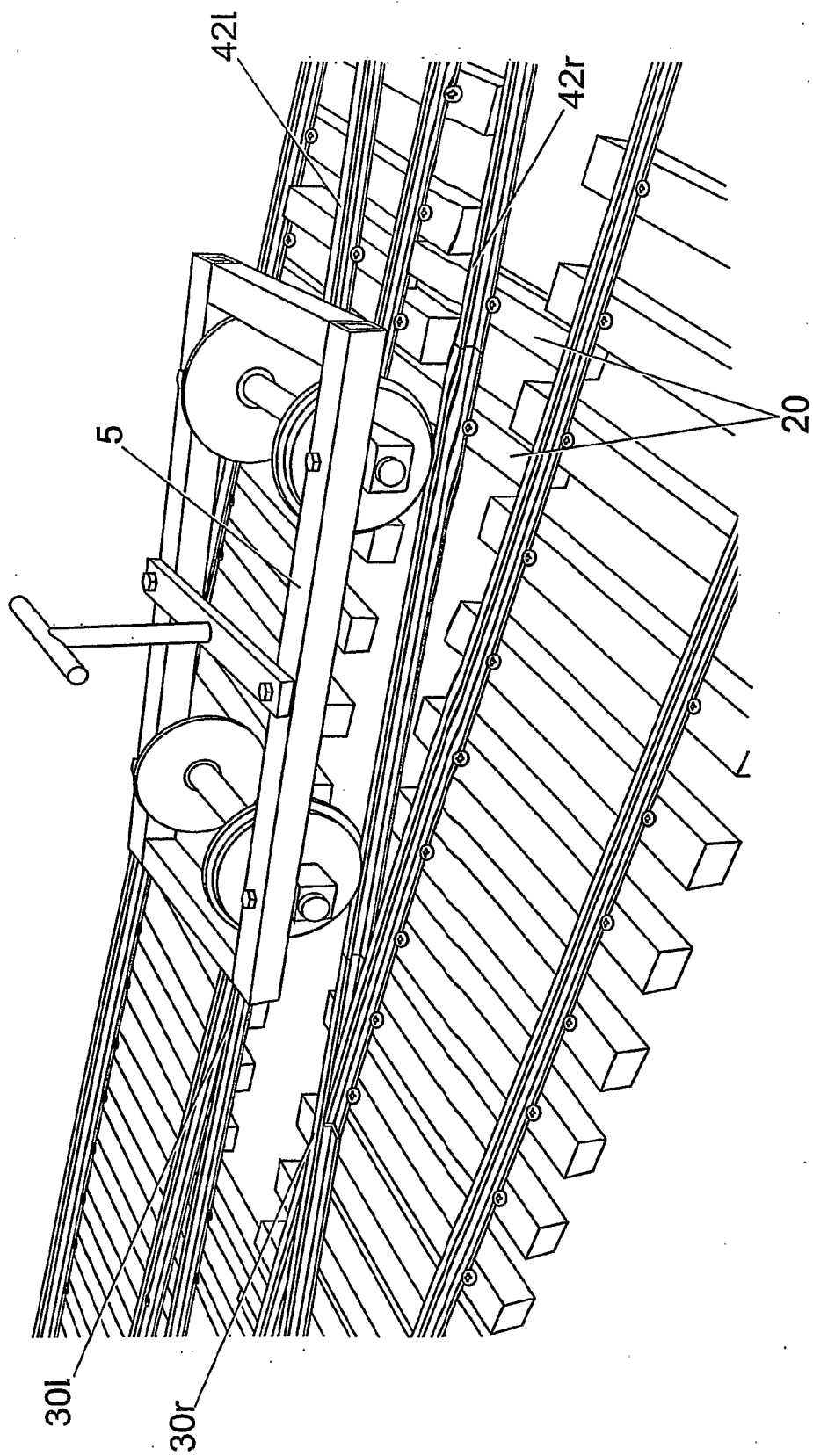


Fig. 17



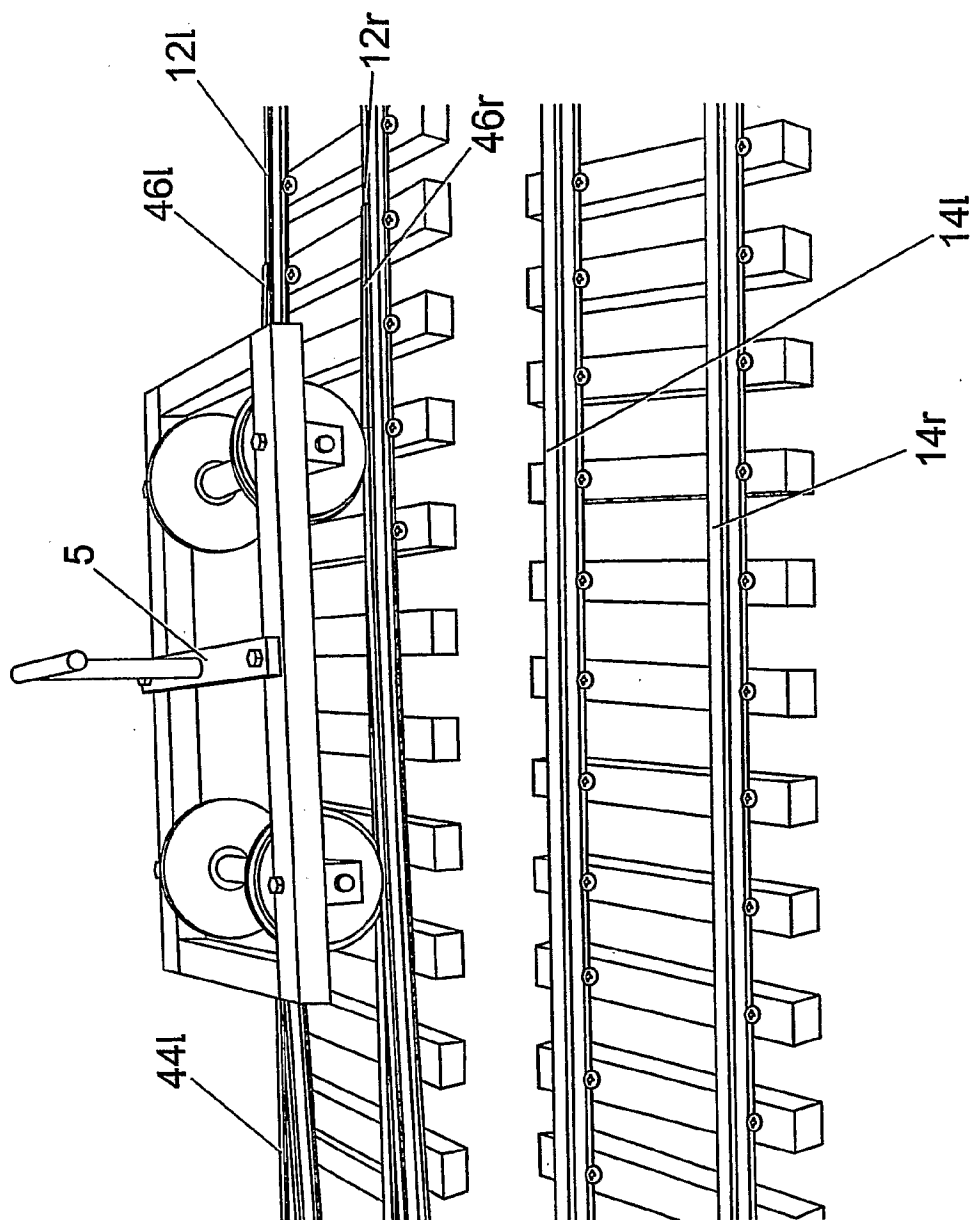


Fig. 18



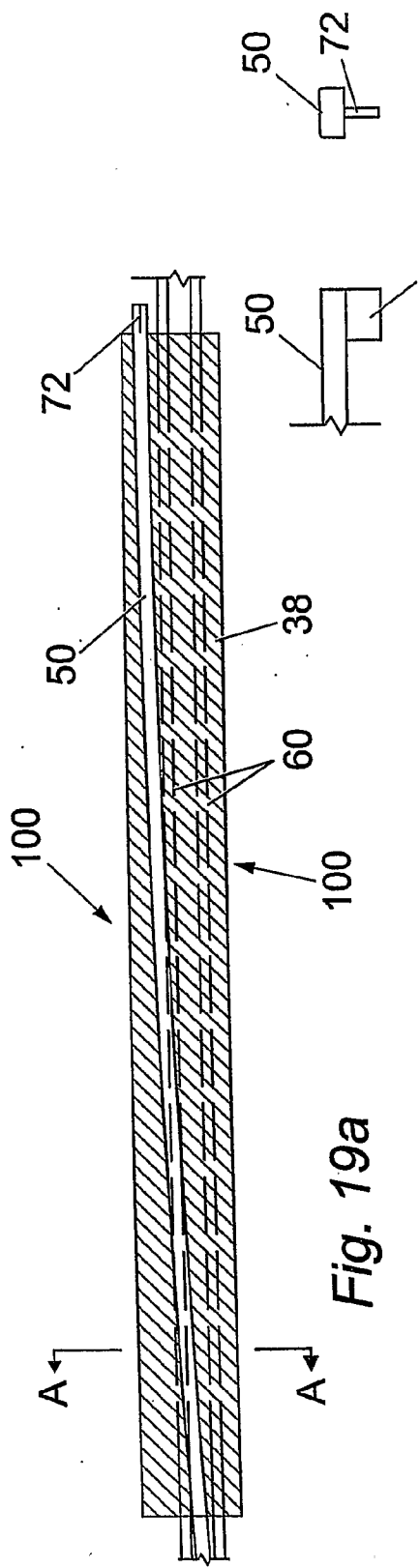


Fig. 19e

Fig. 19f

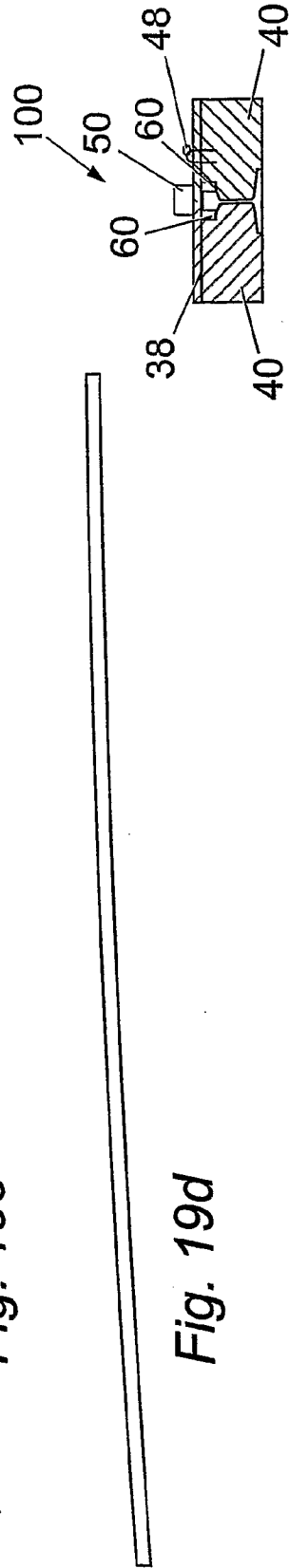
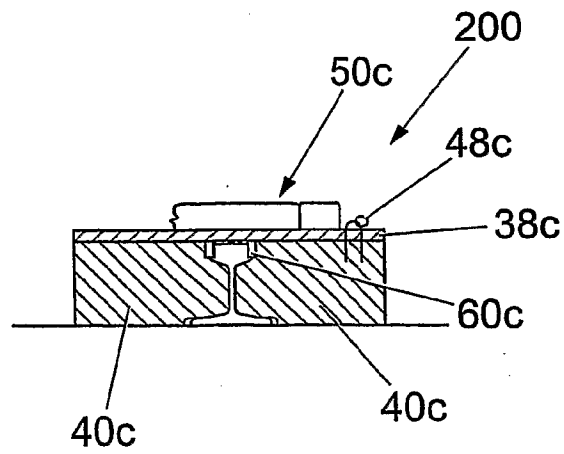
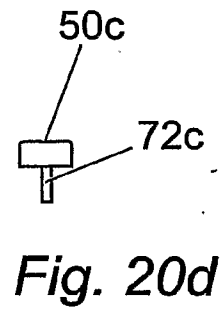
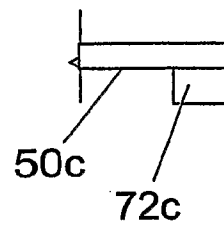
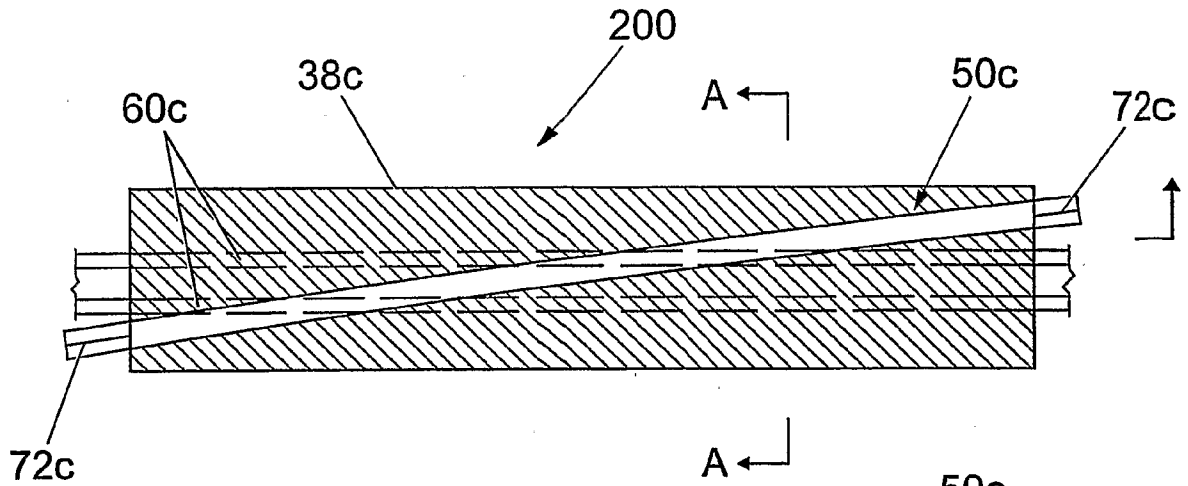


Fig. 19d



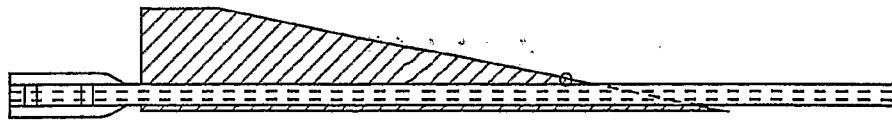


15 / 38





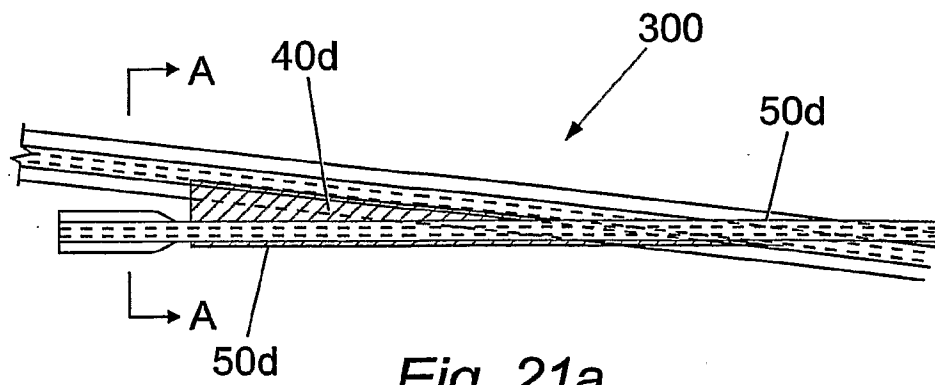
16 / 38



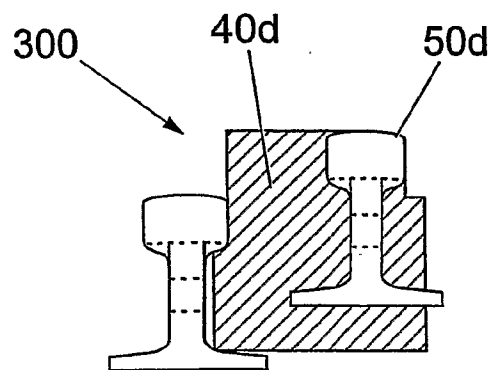
*Fig. 21c*



*Fig. 21d*



*Fig. 21a*



*Fig. 21b*



Fig. 22a

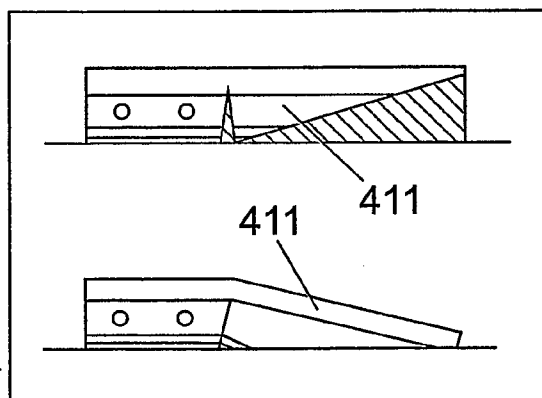


Fig. 22b

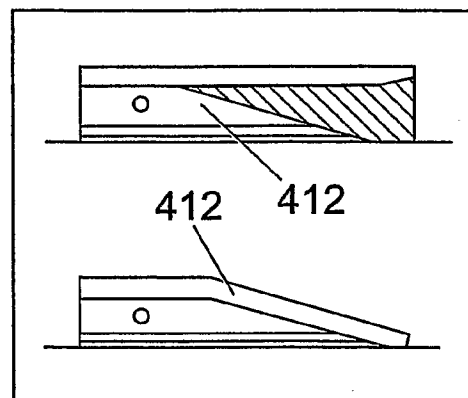


Fig. 22c

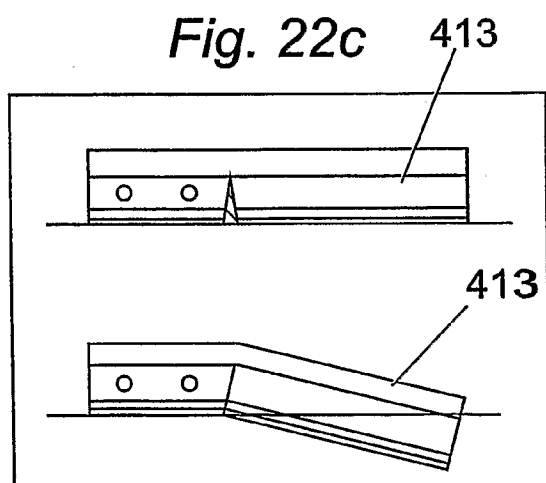
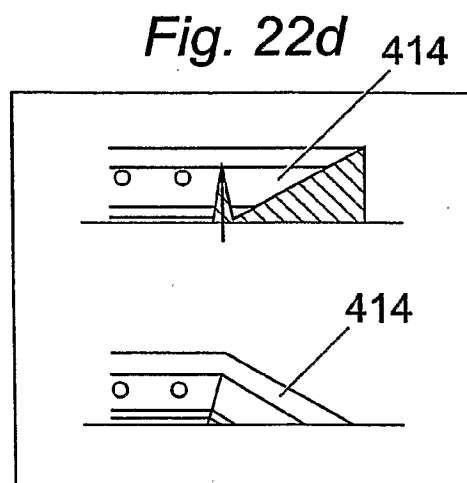
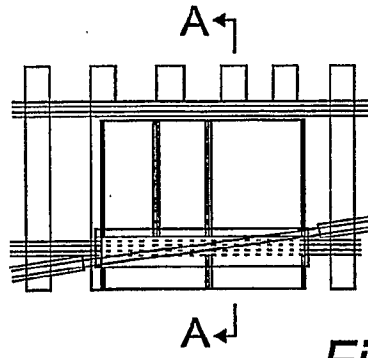


Fig. 22d

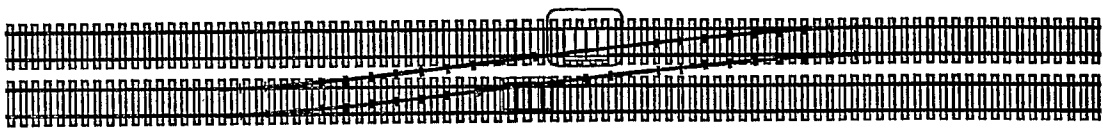




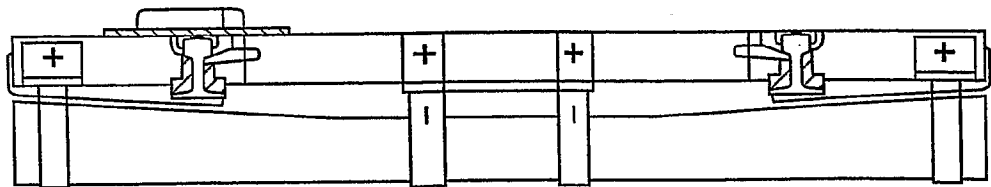
18 / 38



*Fig. 23c*



*Fig. 23e*



*Fig. 23d*





19/38

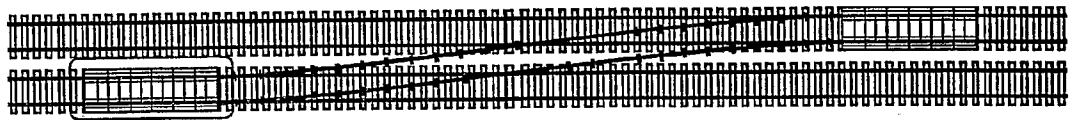
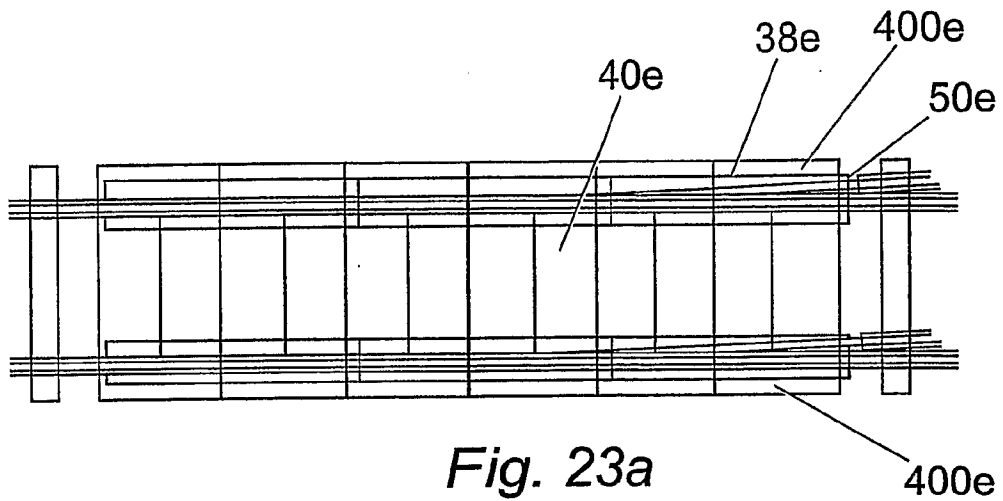
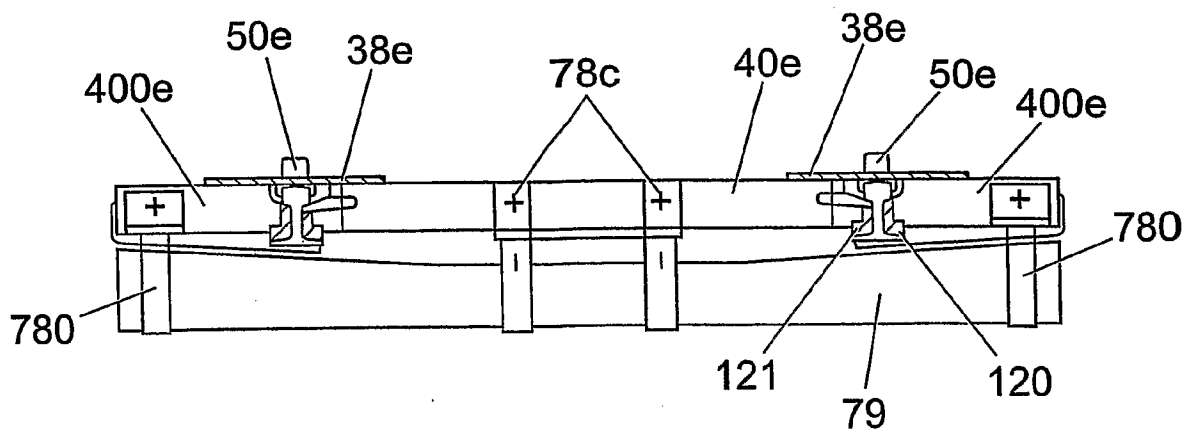


Fig. 23





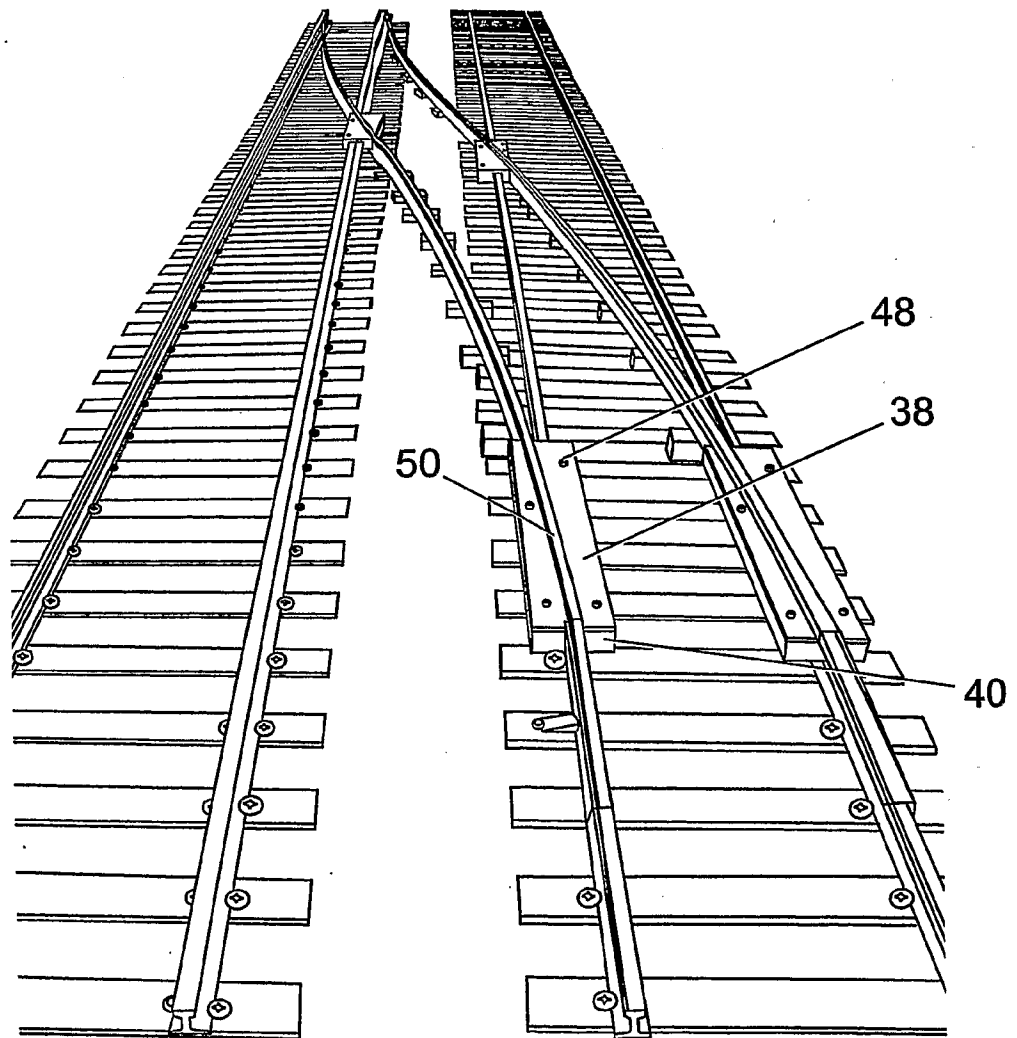


Fig. 24a



21 / 38

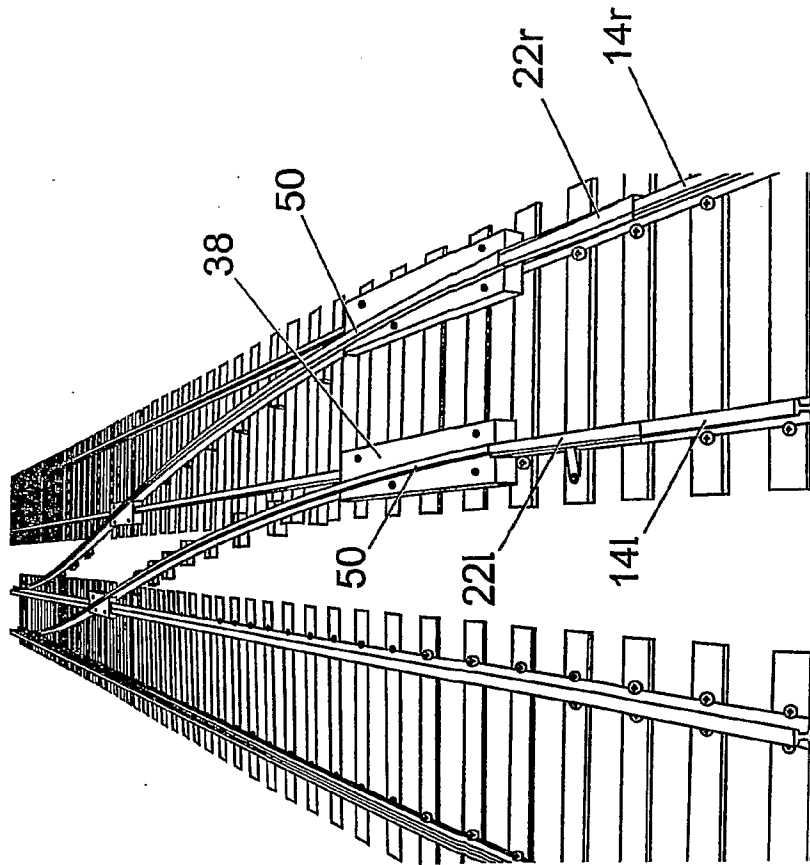


Fig. 24c

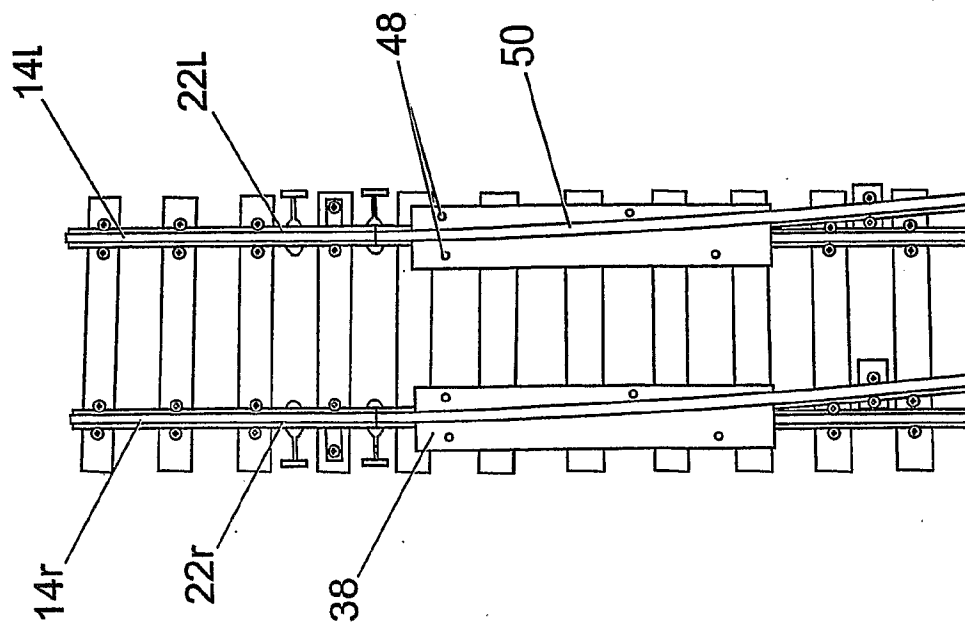
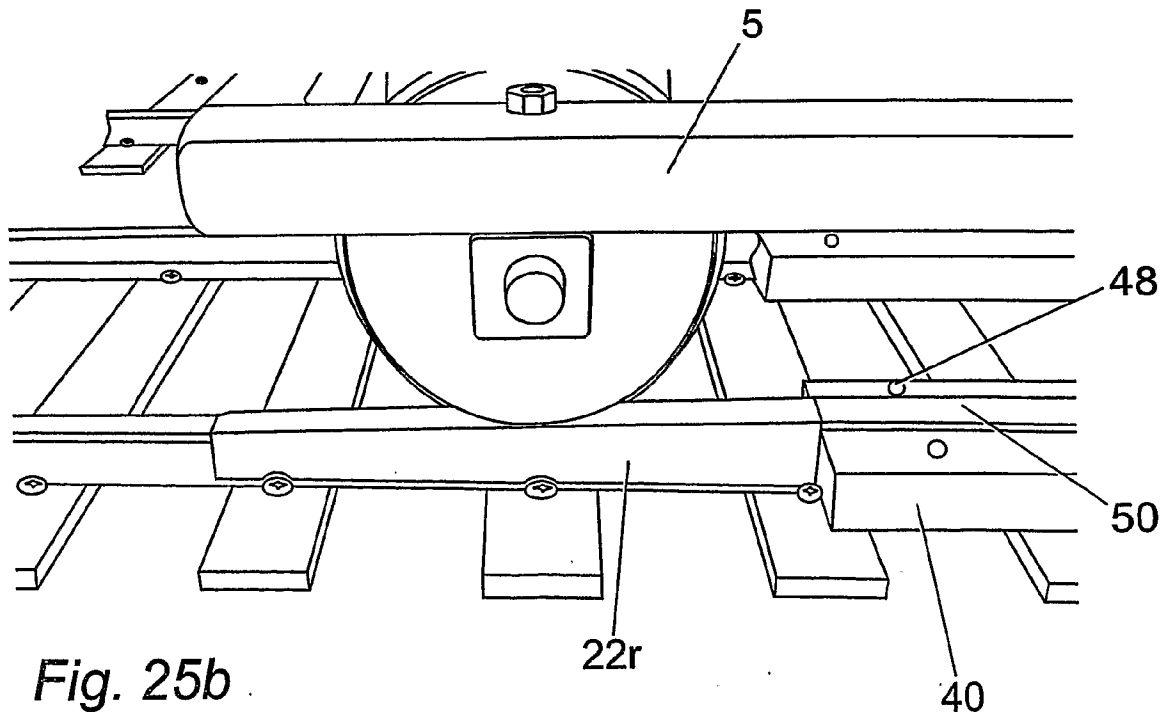
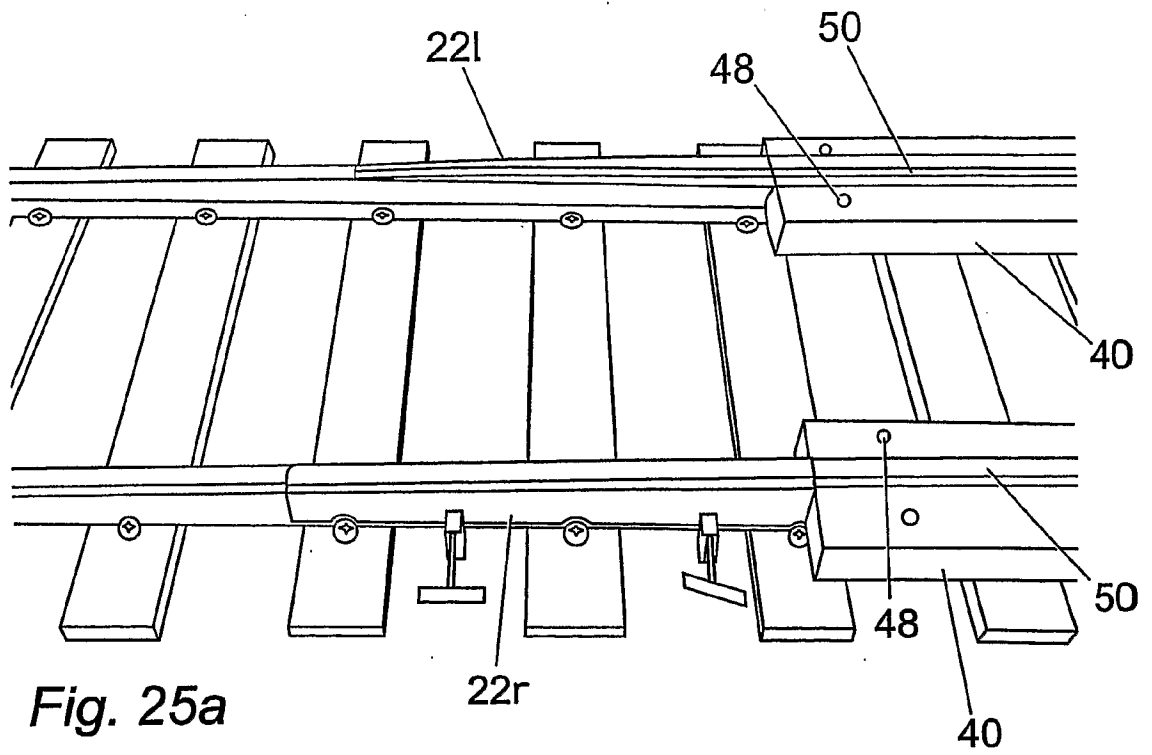


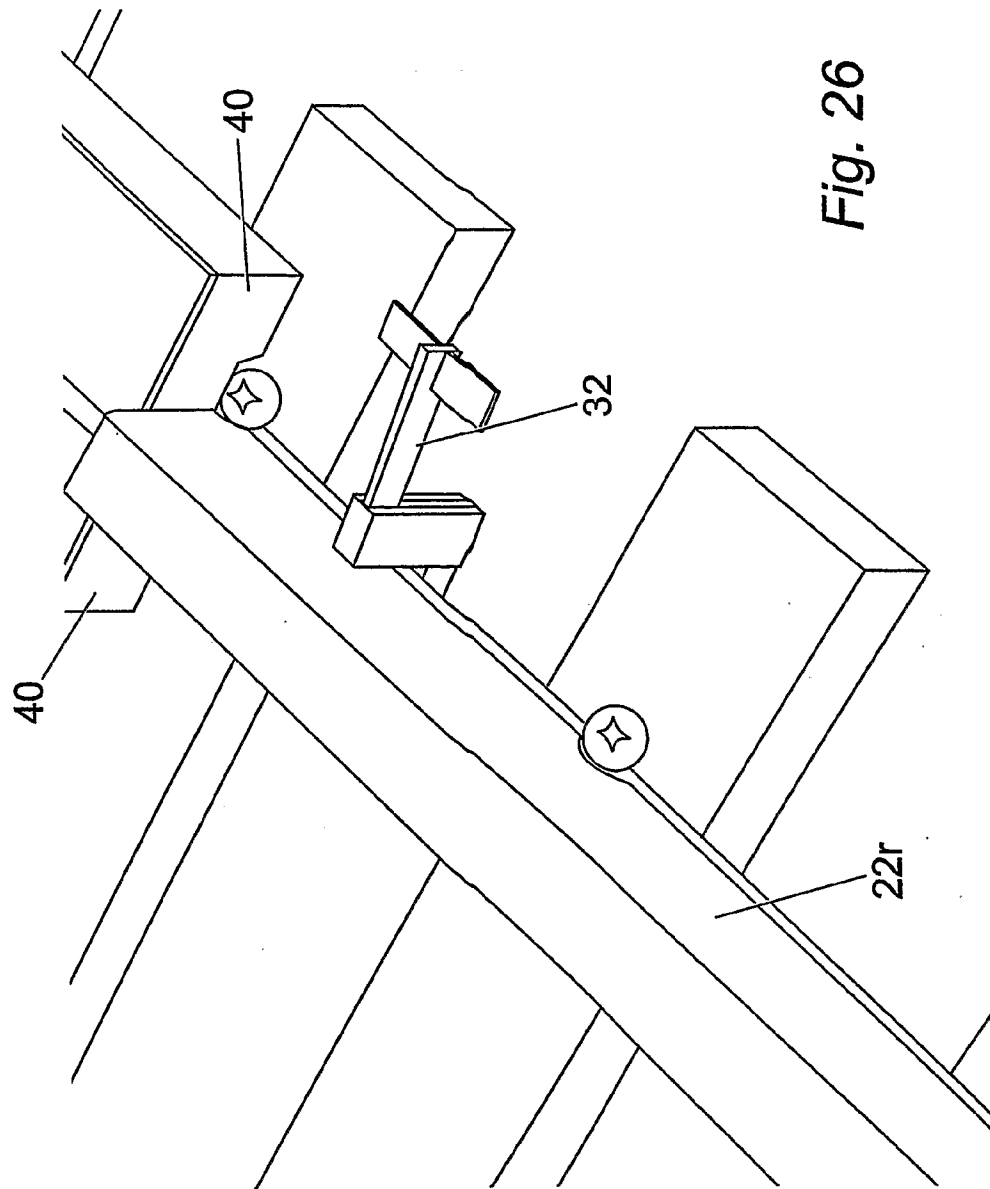
Fig. 24b













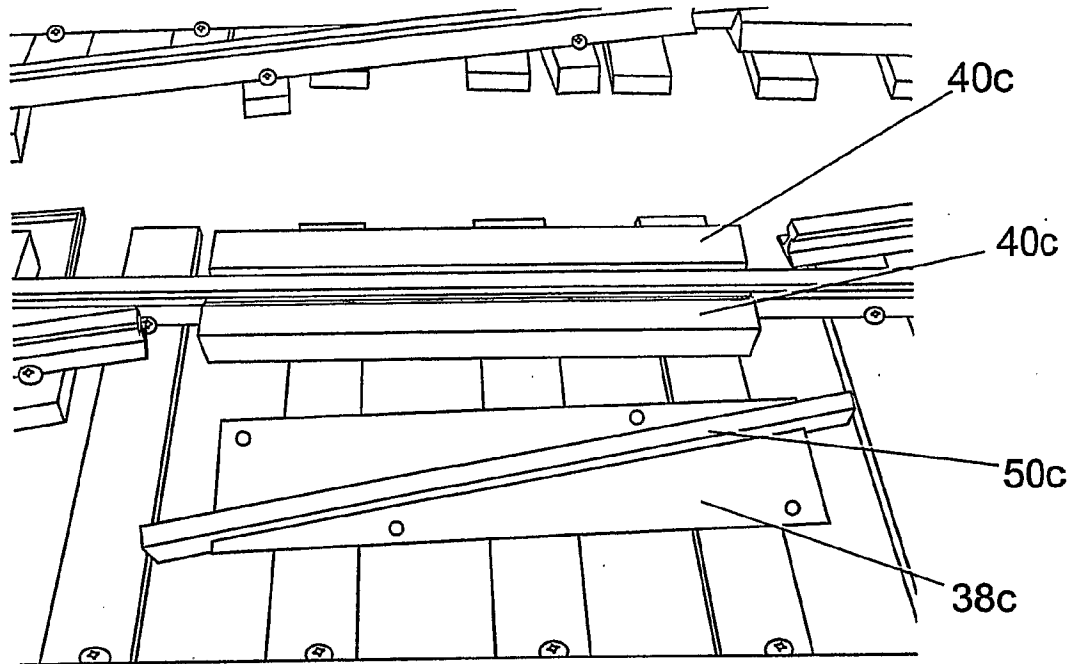


Fig. 27a

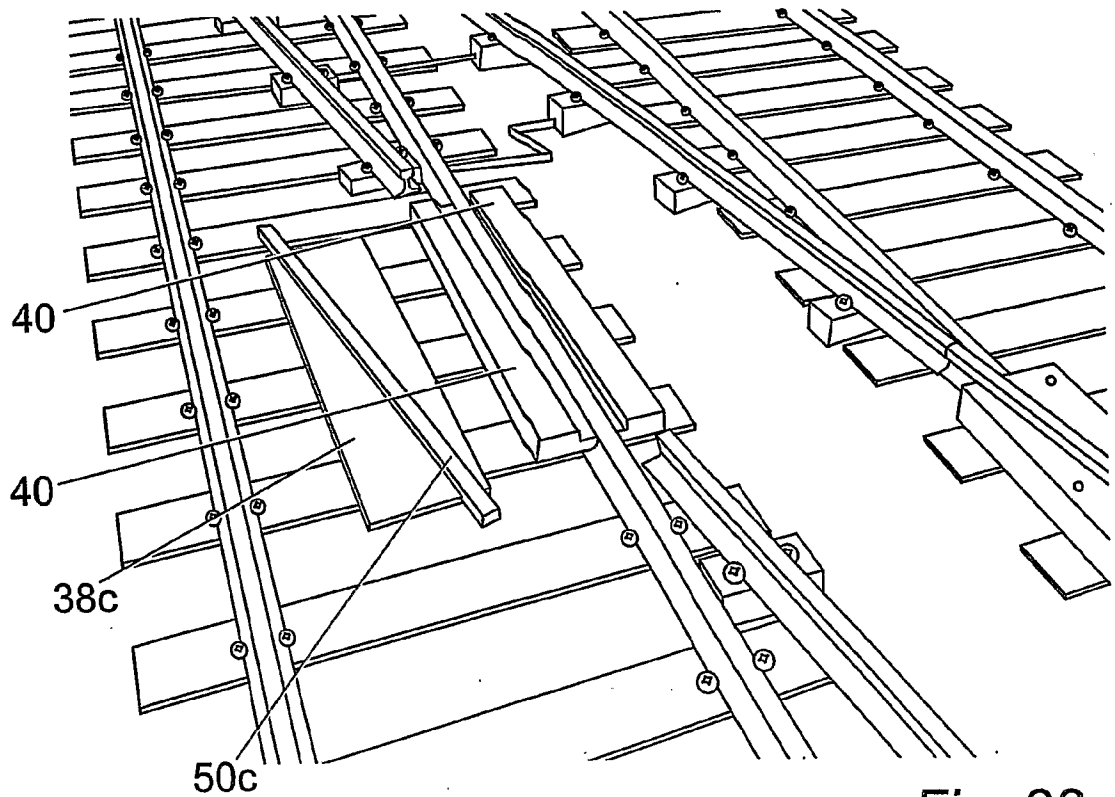


Fig. 28a



Fig. 29b

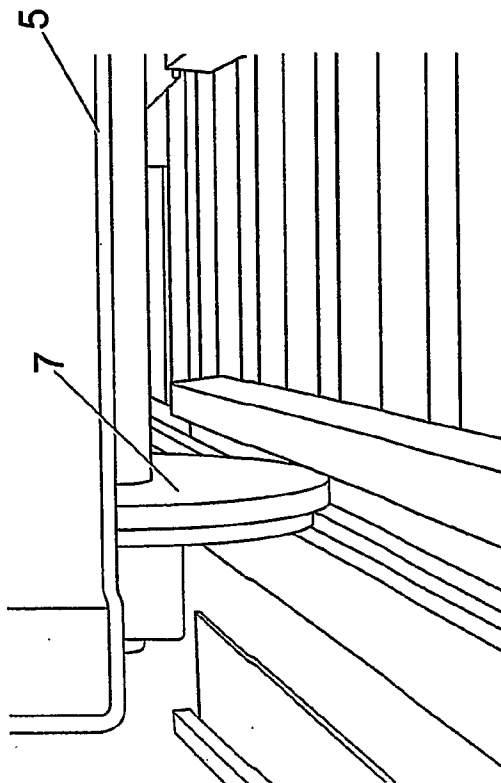
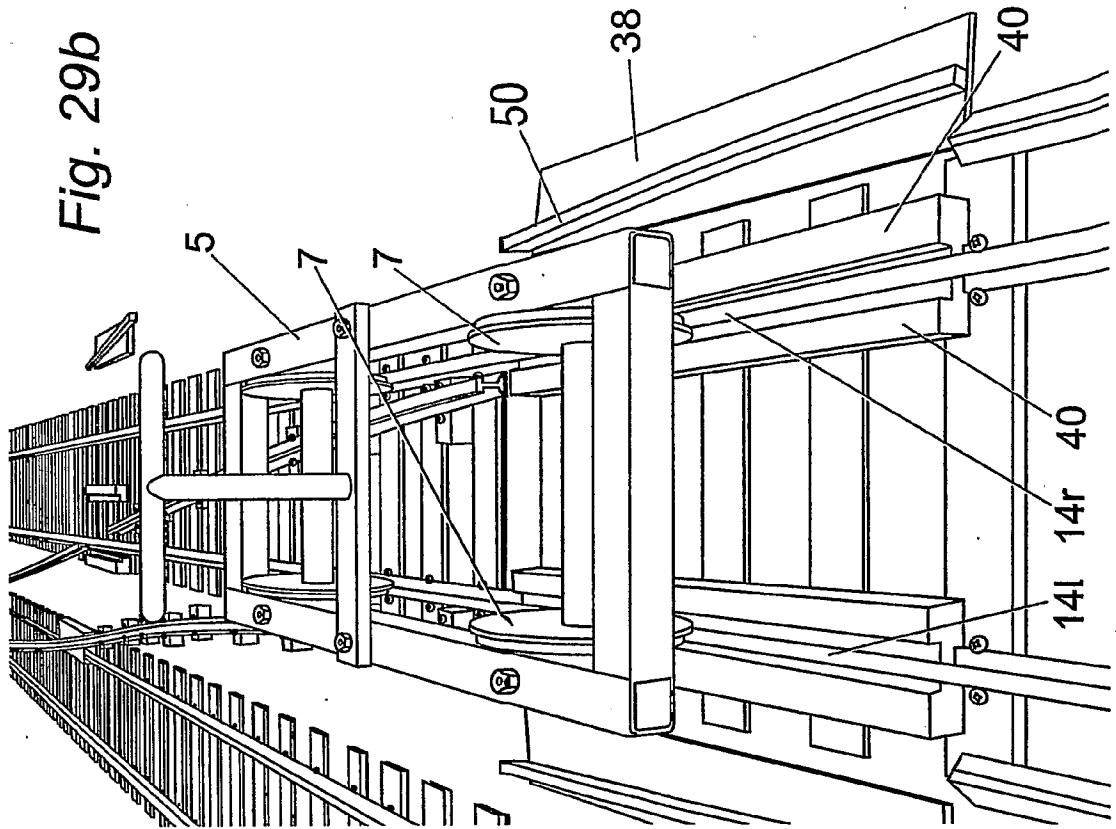


Fig. 29a



26/34

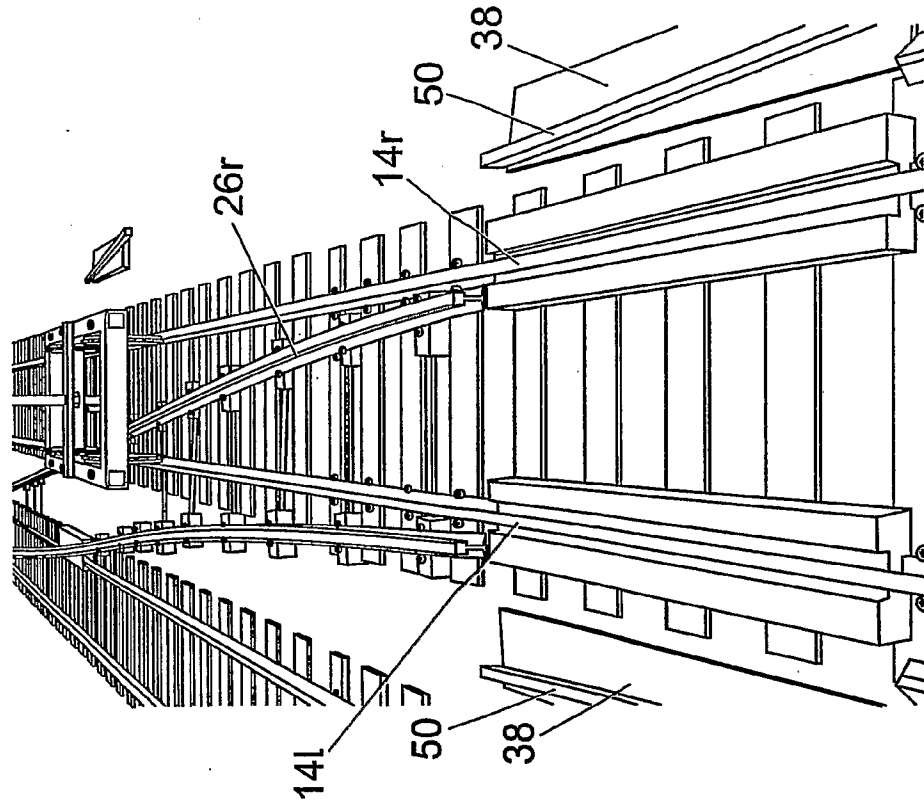


Fig. 29d

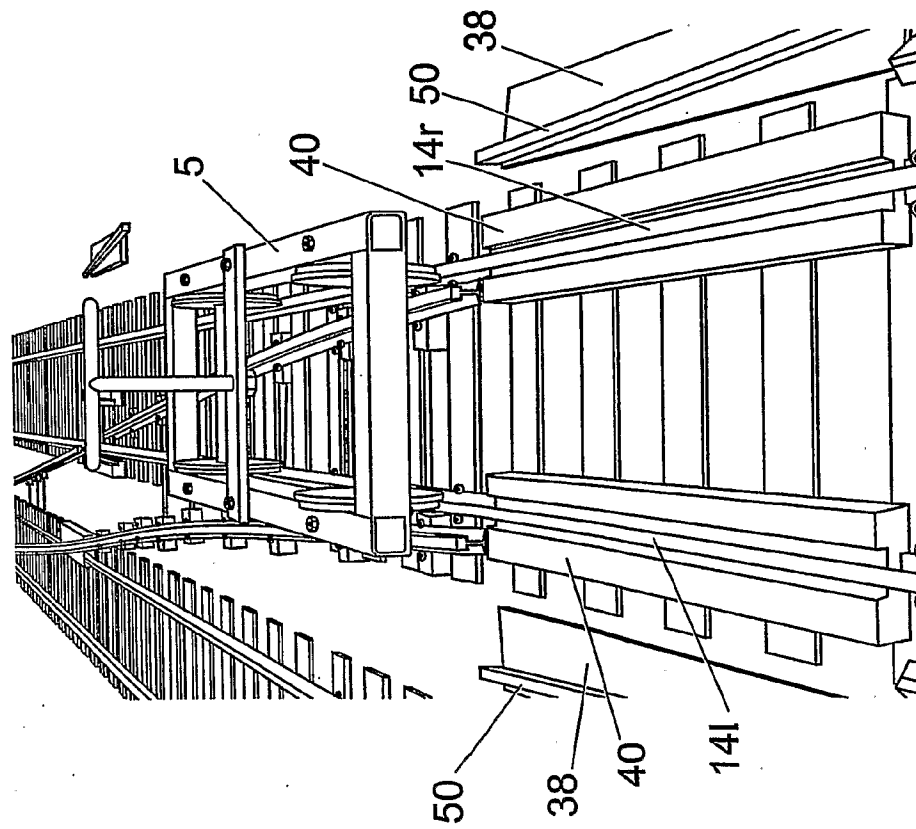


Fig. 29c





27 / 38

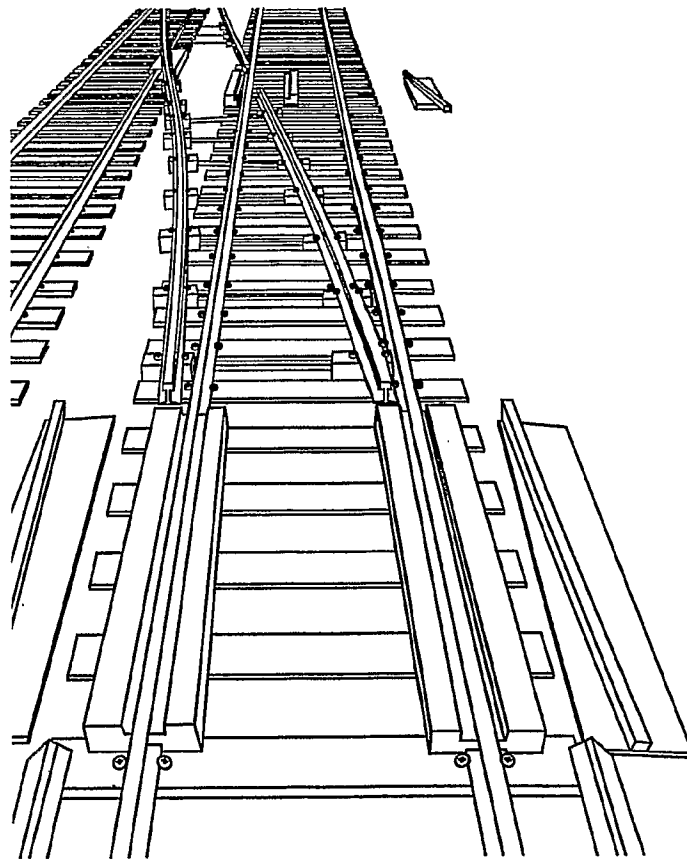


Fig. 29f

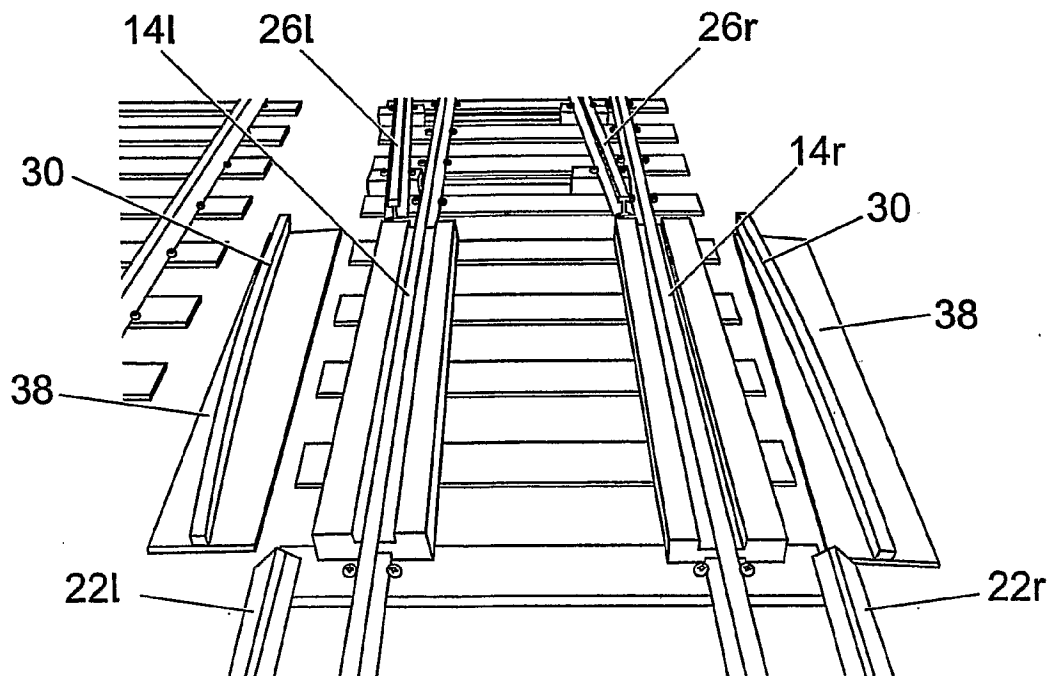
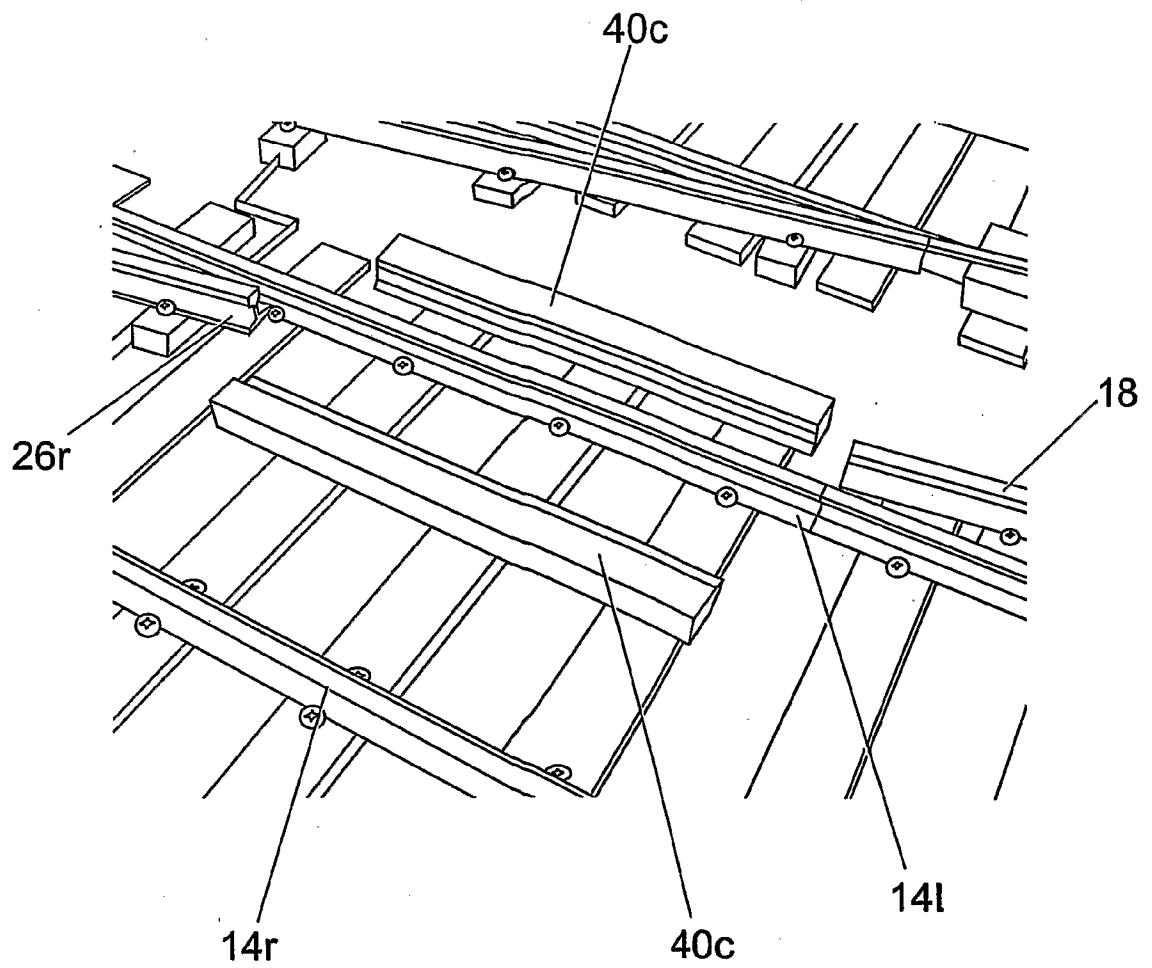


Fig. 29e





*Fig. 29g*



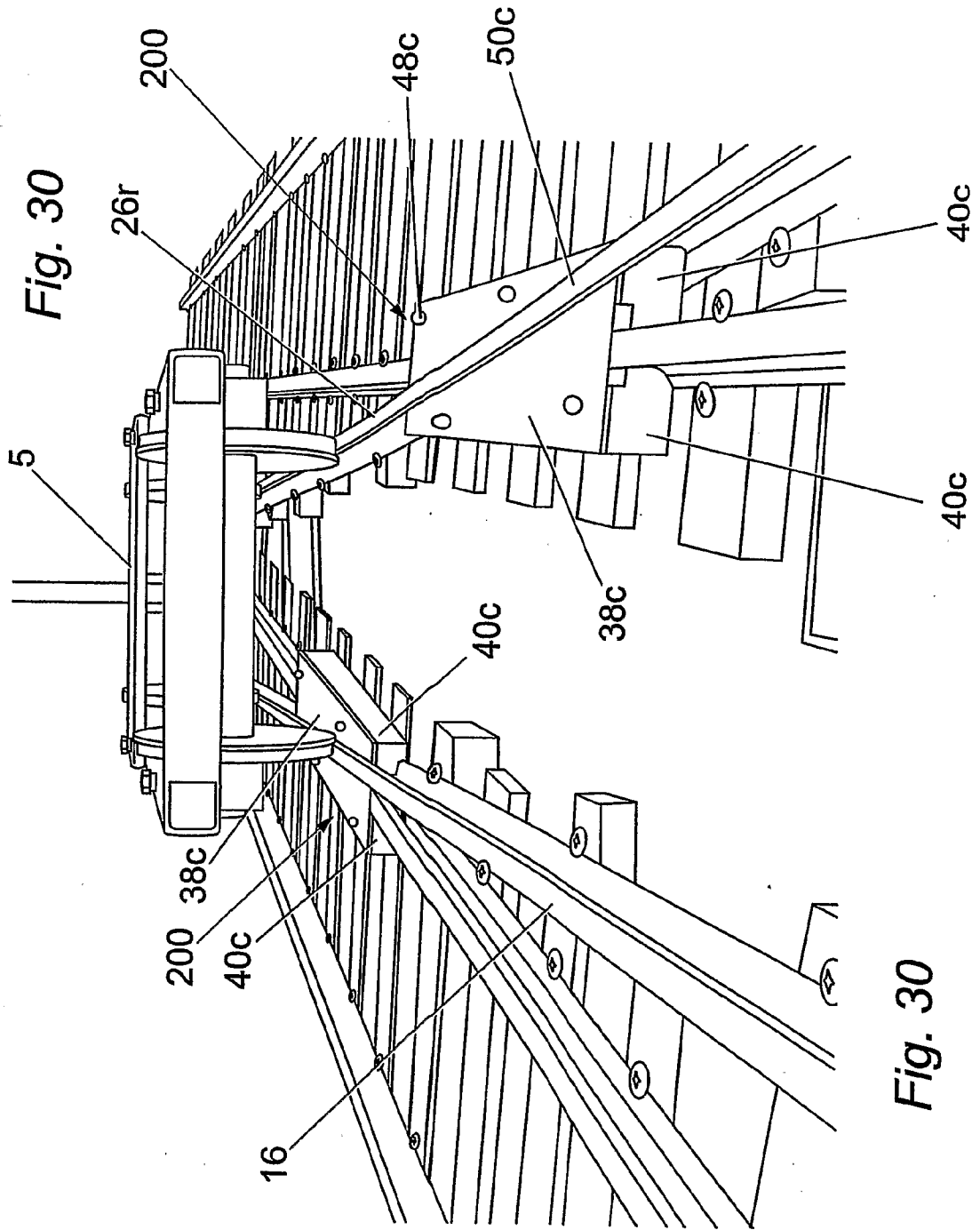


Fig. 30

Fig. 30



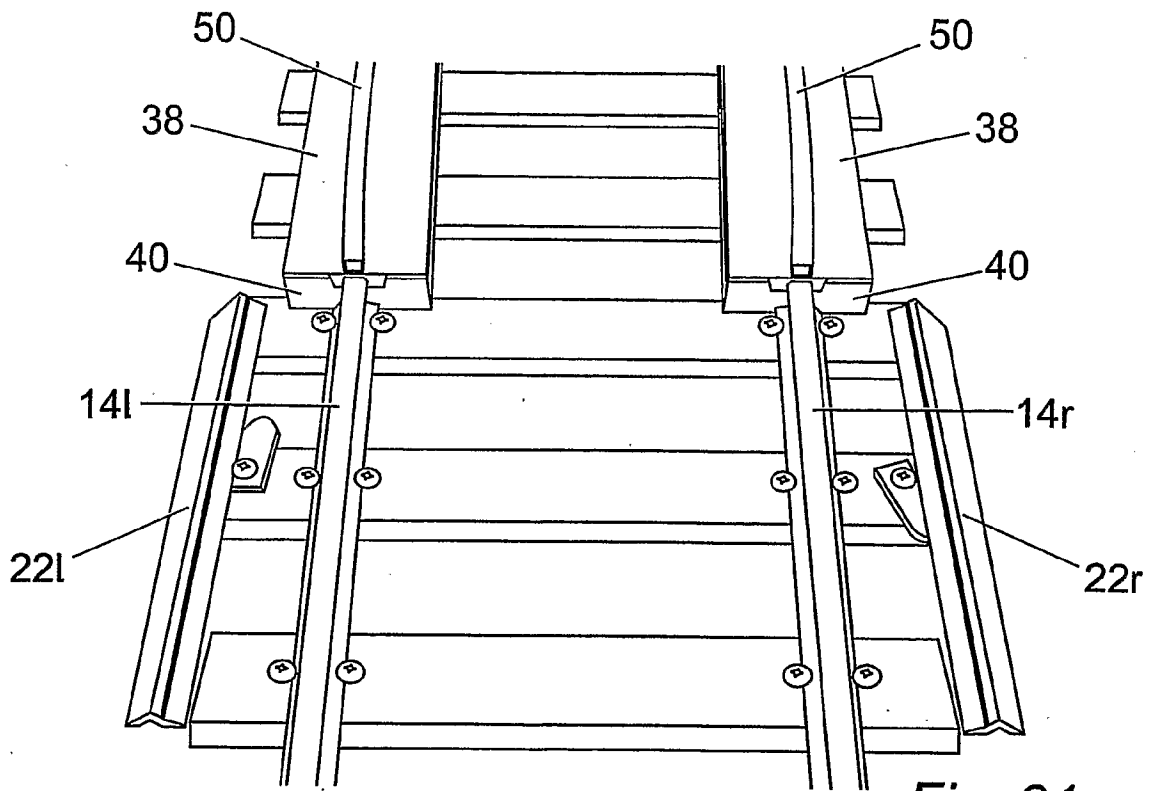


Fig. 31a

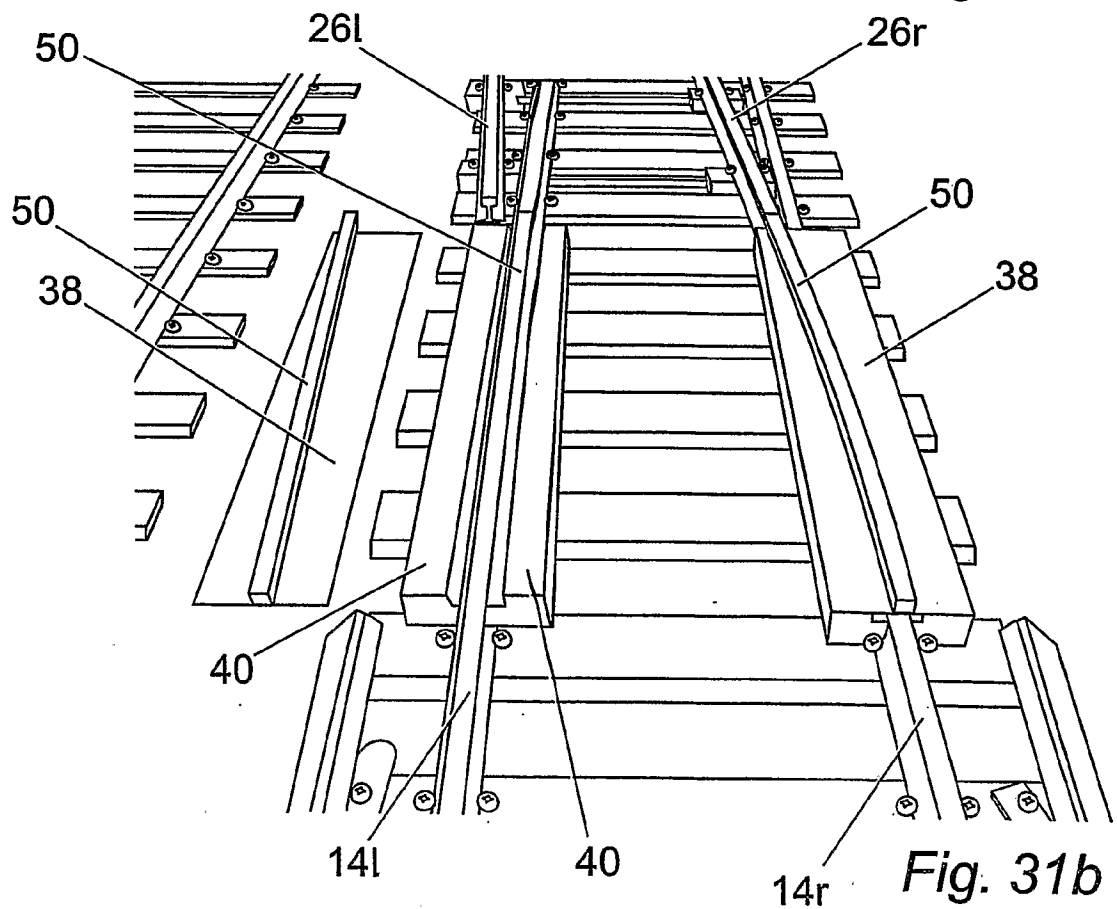


Fig. 31b





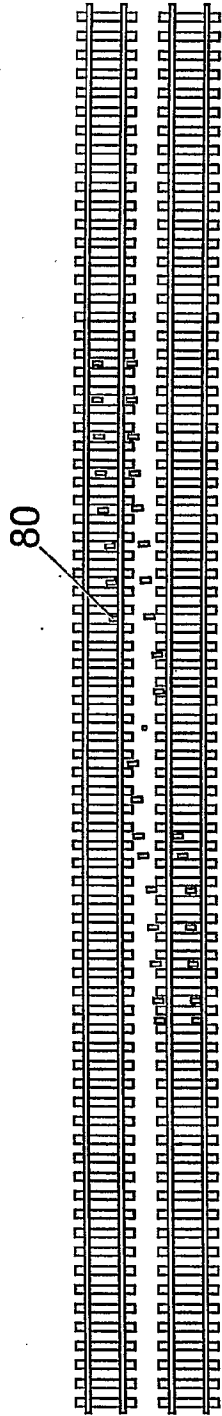


Fig. 32a

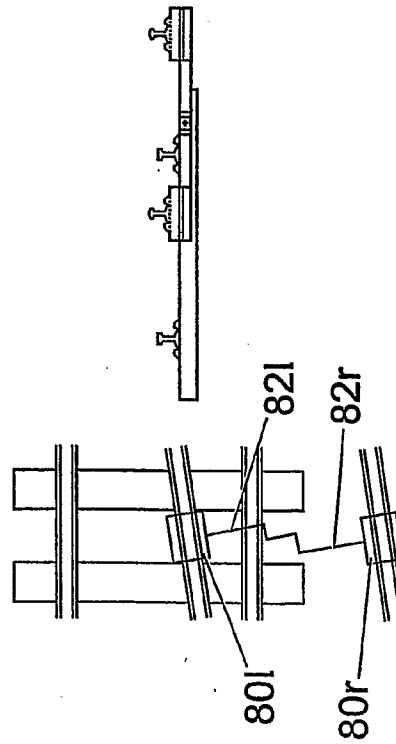


Fig. 32b

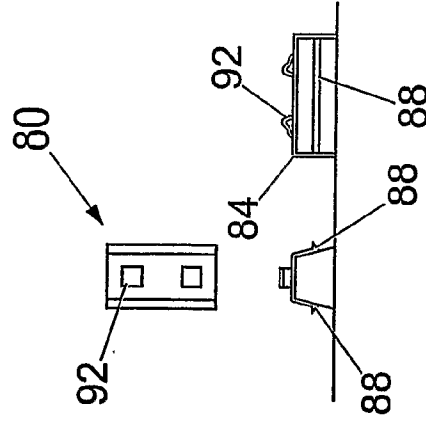


Fig. 32c



Fig. 33a

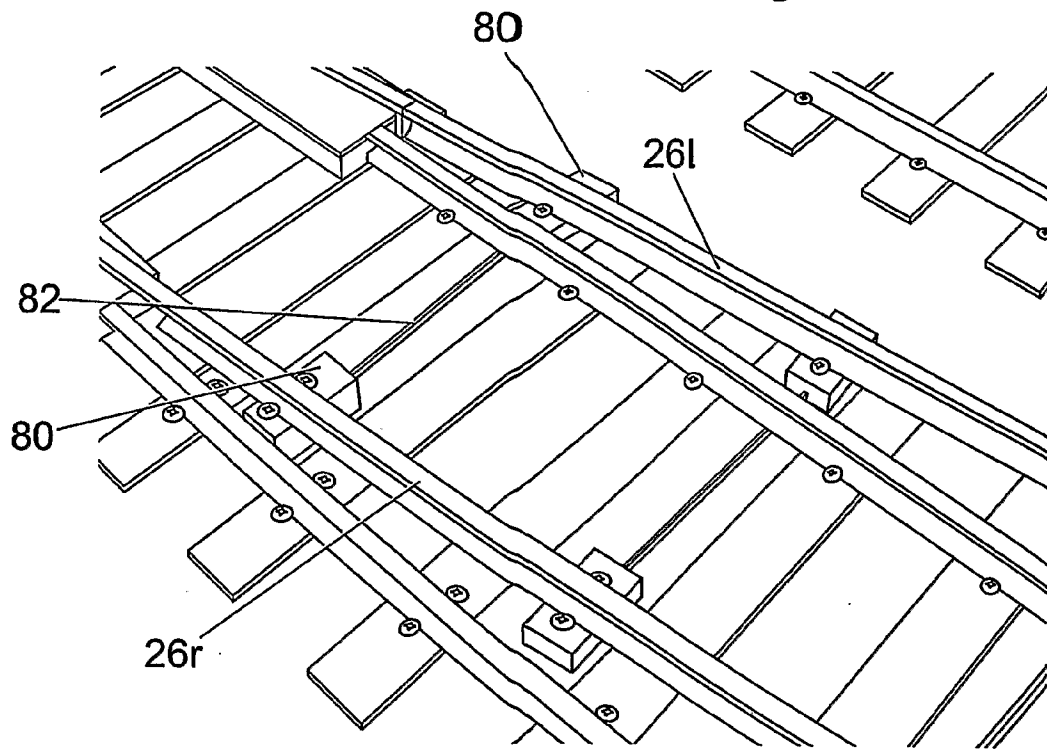
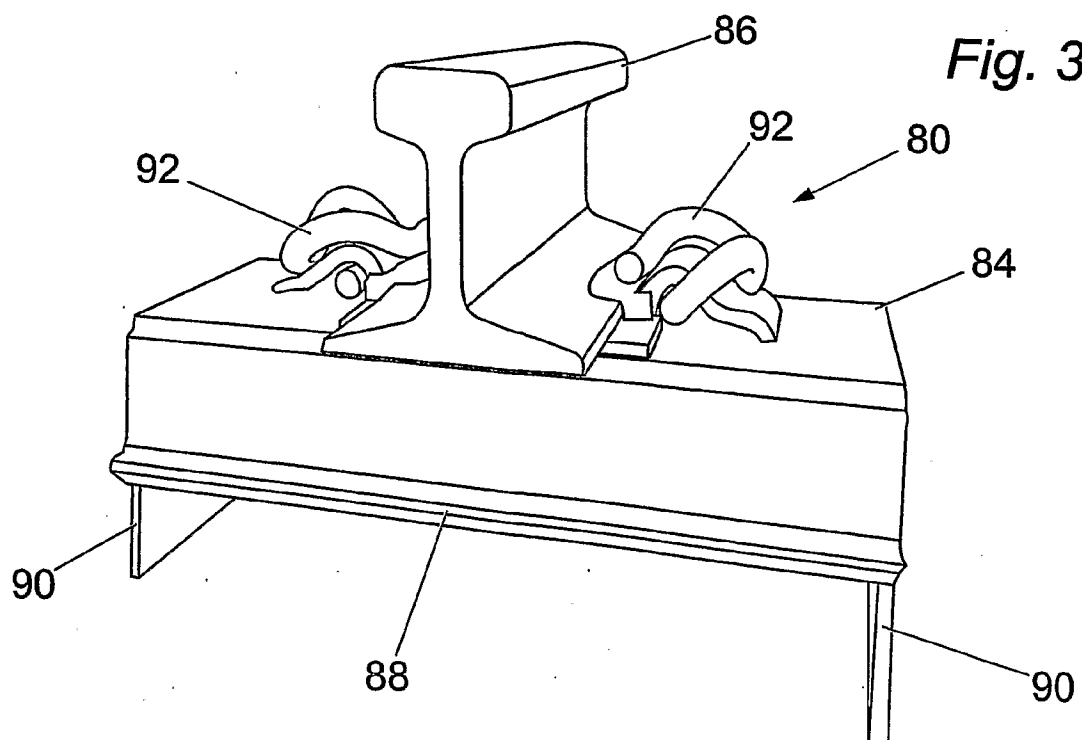


Fig. 33b





33 / 34

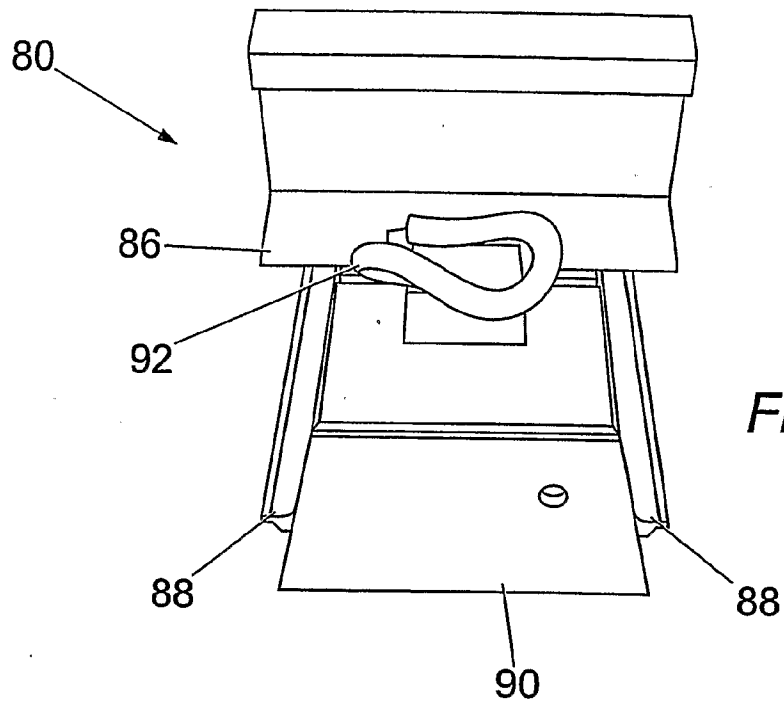
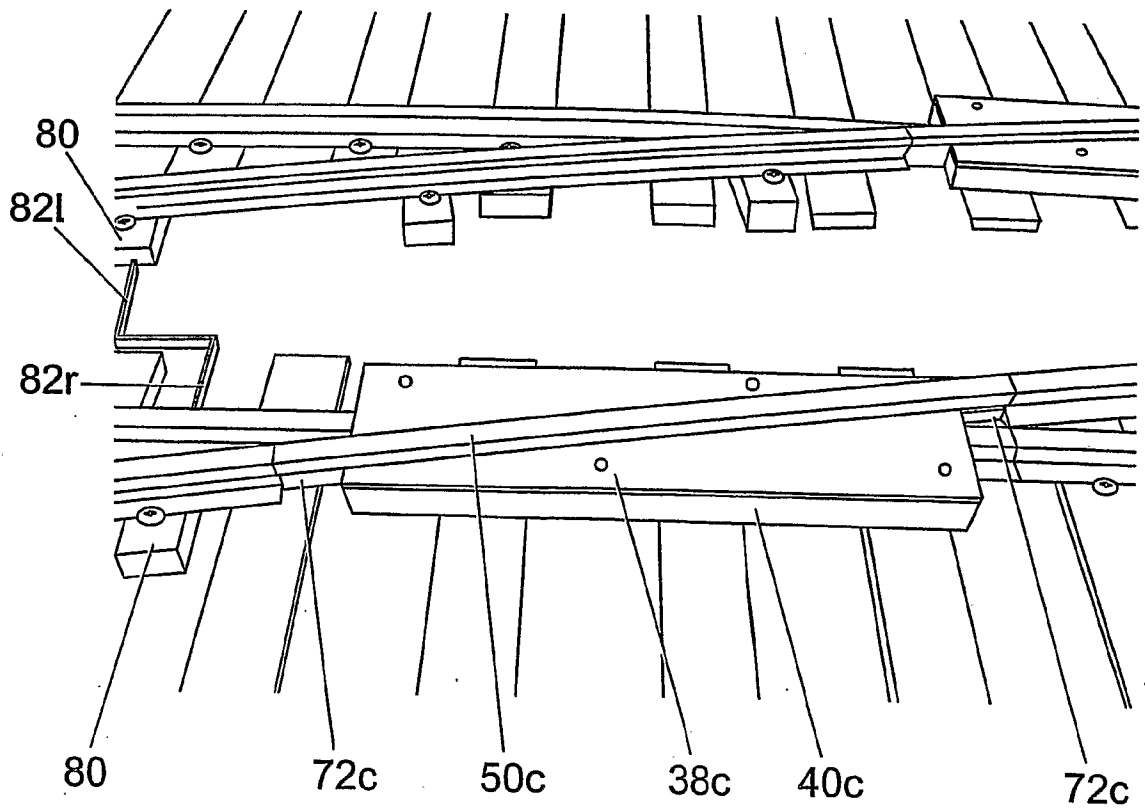


Fig. 34a

Fig. 34b





34 / 34

Fig. 35b

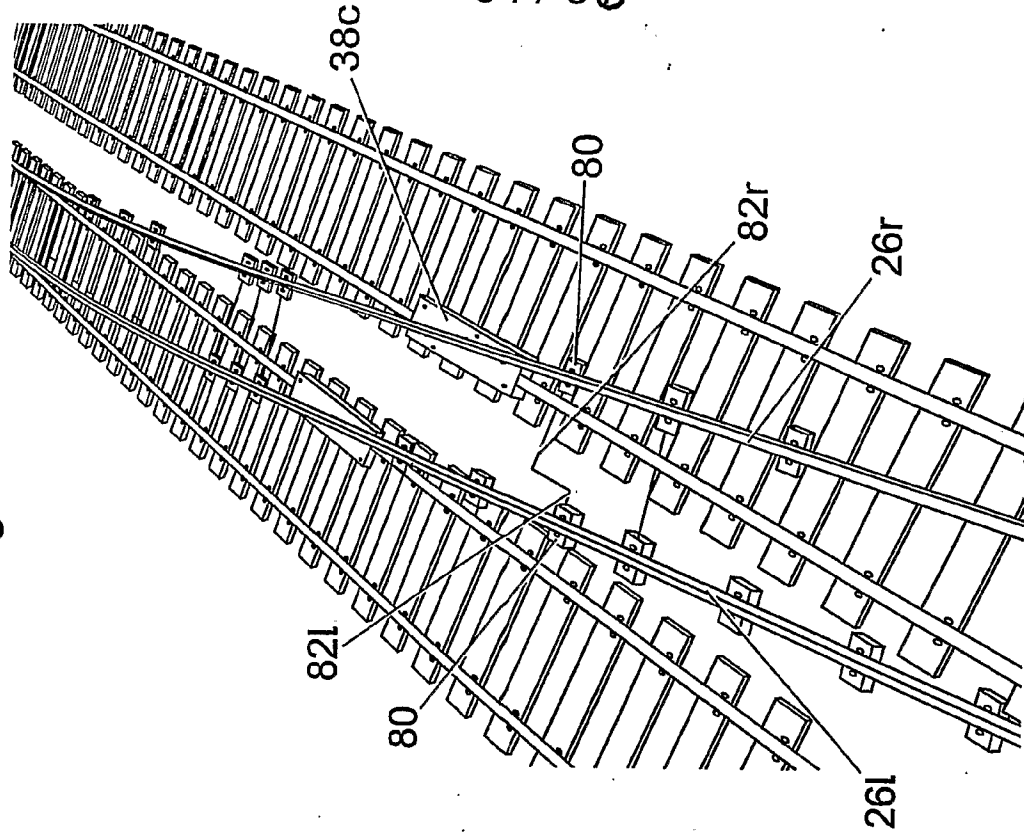
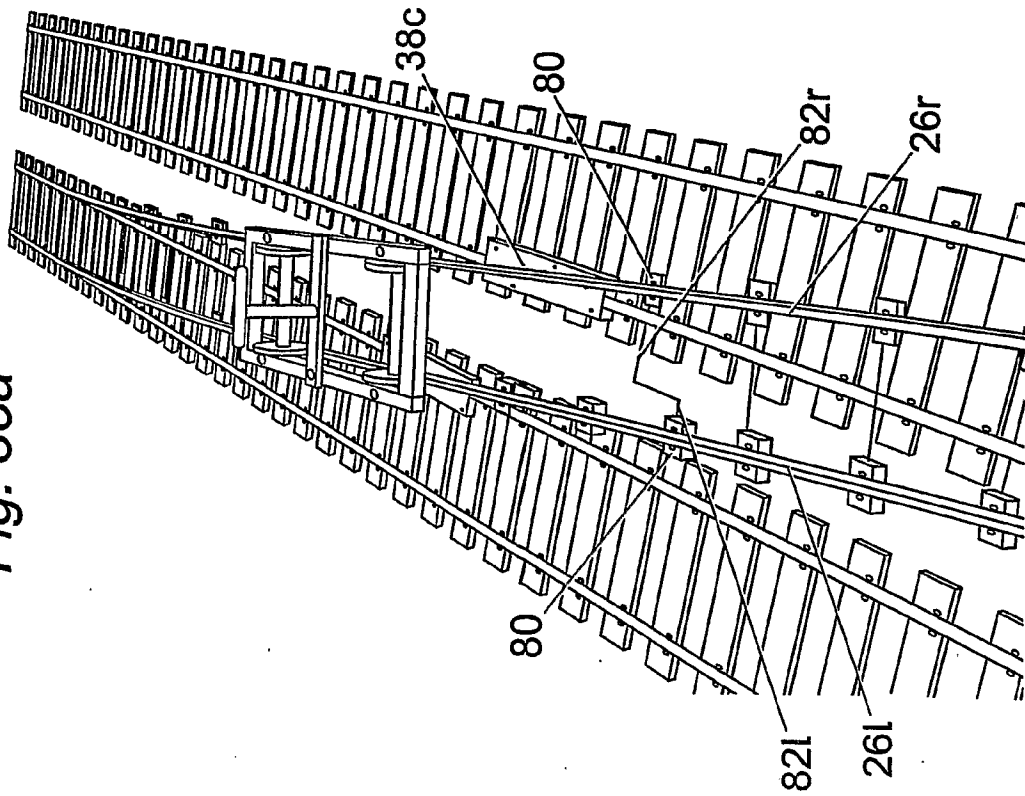


Fig. 35a

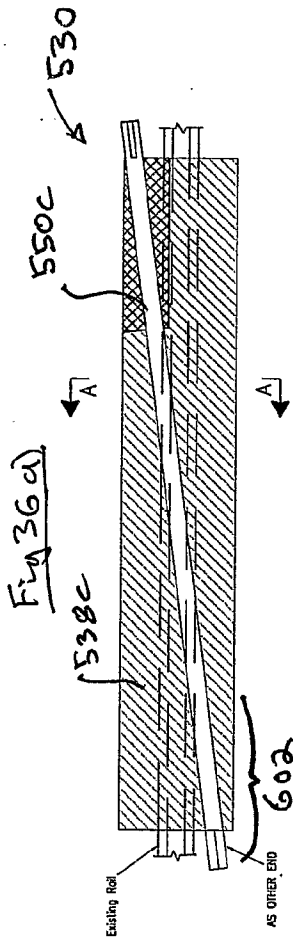




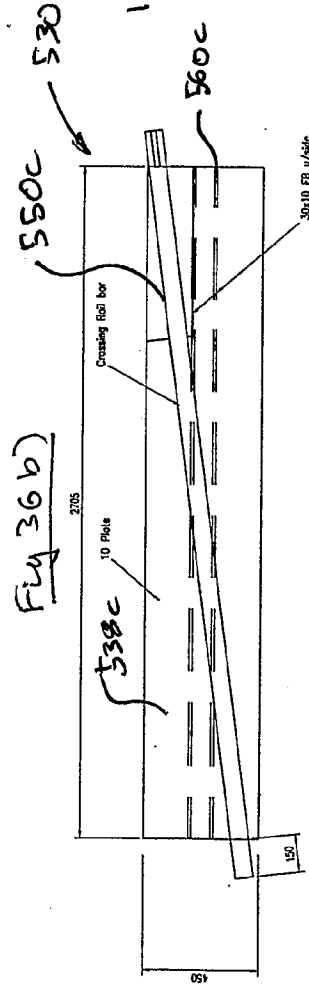


NOTES:

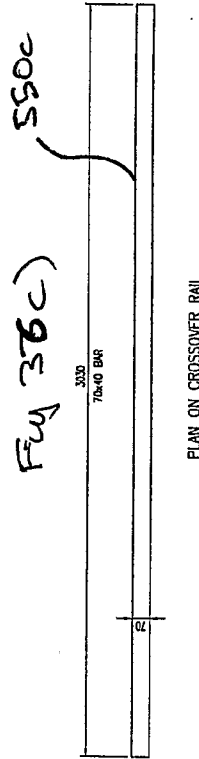
1. Plate provides full support over the area shown.
2. Support detail not shown.
3. Flat bar on underside assists in location and stability.
4. Holding down details not shown.
5. Some or all components may be enlarged.



PLAN ON CROSSOVER DETAILS

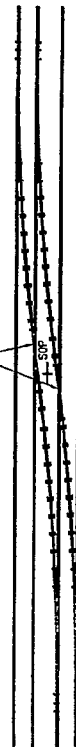


PLAN ON CROSSOVER PLATE/RAIL - MK "C2"



PLAN ON CROSSOVER RAIL

Removed Crossovers  
MK "C2"



CROSSOVER KEY

35/38

CONFIDENTIAL.  
PATENT APPLIED FOR

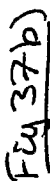
REV	DESCRIPTION	DATE
1	SCOTT-TRACK LTD. 43-43 BROAD STREET, GLASGOW G4 3PL Tel: 011 541 5811 Fax: 011 541 5811 Email: info@scott-track.co.uk	
2	XXX	
3	Contract: MK	
4	NAME: NON INTRUSIVE UNBULATING RAIL CROSSING UNIT CROSSING UNIT	
5	Contract No: 03-03-002	
6	Rev: 21.02.04	
7	Drawn: A.F.	
8	Checked: RA	
9	Approved: HM	
10	Sheet: 1 of 1	
11	Issued for: PAT APP.	



CONFIDENTIAL.  
PATENT APPLIED FOR

1	Notes added	DNM	Nov02
	DESCRIPTION	INTLS	DATE
SCOTT-TRACK L.L.C. 10000 W. 10TH AVE. SUITE 300, GLENDALE, CALIF 91204 TEL: 626-915-1100 FAX: 626-915-1101 WWW: WWW.SCOTTTRACK.COM			
Client	XXX		
Contract	MC		
Title:	NON INTRUSIVE UNDULATING RAIL CROSSING UNIT RAMPED SWITCH RAIL UNIT		
Submitted By:	Donna Mac	Revised By:	3/3/03
Checked By:	Donna Mac	Checked By:	Donna
Date:	2/10/04	NTS	
Quantity:	100	Contract:	100
Unit:	EA	Approved:	1 of 1
PAT.PAT.			
Used for			

1. Piece provides full support over length of switch rail.
2. Support Detail not shown.
3. Flat bar on underside assists with location and stability.
4. Split into 3 sections approx 2.4m long for handling/transport.
5. Hoisting down details not shown.
6. Some or all components may be hinged



PLAN ON SWITCHRAIL PLATE/RAIL - MK "S4"

7229

70150 B18

4524

R185412

55

875-524-

Crossing Rail box  $\frac{70}{100}$

70  
Crossing Rail box

10 PM  
at  
Fry 37d)

**Section A-  
CLOSED**

**Section A-A**  
**OPEN**

53

**SWITCH RAIL RAMP DETAIL**

### Ramped Switches

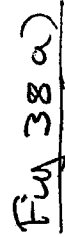
## Romped Switched

### CROSSOVER KEY

Romped Switchoff  
Mr. "53"



1. Drawing shows Standard Double
2. Standard 6 FL. (197Qmm)
3. S.O.P. = Selling out Pool (for crossing)
4. Standard Track Gauge (1432mm)



37/38

CONFIDENTIAL.  
PATENT APPLIED FOR

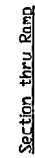
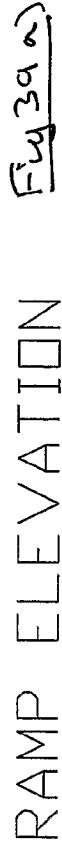
[illegible]

SALINIDAD (‰)	SALINIDAD (‰)			
	1950-55	1956-60	1961-65	1966-70
0-5	1000	1000	1000	1000
5-10	1000	1000	1000	1000
10-15	1000	1000	1000	1000
15-20	1000	1000	1000	1000
20-25	1000	1000	1000	1000
25-30	1000	1000	1000	1000
30-35	1000	1000	1000	1000
35-40	1000	1000	1000	1000
40-45	1000	1000	1000	1000
45-50	1000	1000	1000	1000
50-55	1000	1000	1000	1000
55-60	1000	1000	1000	1000
60-65	1000	1000	1000	1000
65-70	1000	1000	1000	1000
70-75	1000	1000	1000	1000
75-80	1000	1000	1000	1000
80-85	1000	1000	1000	1000
85-90	1000	1000	1000	1000
90-95	1000	1000	1000	1000
95-100	1000	1000	1000	1000

LONGITUDINAL SECTION

Fy 38b)





Fin 39d)



PCT/GB 2005 / 000703

PCT/GB 2005 / 00070

